Introduction and Background.

The Dynamics Of Discontinuous Change.

There aren’t that many universals in life. One of the few – and one of the most important when it comes to understanding how change occurs – is the s-curve. S-curves describe how all systems evolve.

Whatever the system exists to do – the outcomes it delivers – when it first appears, it tends not to be effective. If it does sufficient, sufficiently better than its alternatives, then effort is expended to improve its effectiveness. At first, this effort reaps rich rewards. A small amount of effort delivers considerable improvement in the system. If this job is done for a long enough period of time, the system evolves past a tipping point and begins to be attractive to more and more users. A virtuous cycle appears. This virtuous cycle creates the steepest rising part of the s-curve. Life is good. Each bit of improvement effort that goes in to the system, delivers a higher level of improvement. And then it doesn’t. The curve reaches a point where the slope of the curve stops increasing and begins to decrease. More and more effort is expended, and each new piece of that effort delivers a progressively smaller improvement in the effectiveness of the system. The virtuous cycle no longer appears to be working, and a new, vicious, cycle kicks in. The harder people try to improve the system, the more the vicious-cycle fights back, The curve gets flatter and flatter, until, if improvement work continues long enough, it becomes totally flat. No matter how much new improvement effort is made, the system remains fundamentally stuck in what it will deliver back again. This vicious cycle is all about the emergence and strengthening of contradictions. The reason the top of an s-curve gets flat is not because we stop trying to improve its effectiveness, but because something comes along and stops us.

Figure 1 S-Curves & Virtuous/Vicious Cycles.

Thanks to many decades of ‘operational excellence’ and the deployment of improvement tools and methods like Lean and Six Sigma, today’s world finds itself with a very large proportion of businesses sitting at the top of their respective s-curves. The problem for all of them is that all of the tools, methods and strategies that allowed the s-curve to be climbed no longer work. Optimization no longer works when we’re sat at the top of the s-curve. Most organisations have no idea what to do when they hit this position. The usual reaction is to work the optimization tools even harder. The problem is that the top of the s-curve defines a fundamental limit of the current system. Fundamental, unfortunately for all of the enterprises that find themselves at the top of their curve, means precisely that. We could optimize the system from today to eternity and not make the slightest improvement beyond the fundamental limit. People get frustrated. Managers get angry. No-one likes beating their head against a wall for too long.

The only answer is to solve the contradiction. Most enterprises have no idea that such things are possible. That’s because everything everyone has been taught – through school, college and, worst of all, MBA programmes – is how to make trade-offs. Trade-offs are generally speaking seen as bad. That’s why we’ve been taught to call it ‘optimization’. That sounds much better. But it is totally different to ‘solving the contradiction’. Everyone knows ‘you can’t have your cake and eat it’, but some people choose not to accept it. These are the innovators. The people that will come along and put your organisation out of business. For the most part, they won’t be your current competitors. That’s because they’re busy ‘optimizing’ too. Most innovation comes from outsiders to the industry. That happens because very often the newcomers are too dumb to know that they can’t have your cake and eat it. They come along and solve the contradiction while you’re still running your latest Design Of Experiments charade.

The Business Matrix is a distillation of all of the people who decided not to accept the trade- offs, the people that decided they were going to have their cake and eat it, and somehow prevailed. Just over nine million of them at the time of writing. Shortly, we’ll examine some of them in a bit more detail in order to see how the Matrix has been built and refined over the last twenty years.

For the moment, the emphasis is on the relationship between contradiction solving and s- curves. It’s rare for me to encounter people that haven’t heard of s-curves these days. Most people, too, seem to be able to intellectualise why they look like they do.

But then, somehow, when it comes to connecting it to themselves, the work they do, and the systems they operate within, something seems to go awry.

Try and talk about how the spread of technology always gives an s-shaped curve and people seem to be able to picture what’s happening. Innovator’s, early adopters, early majority, late majority, laggards. Some customers come to the party earlier than others.

But then try and apply the same s-curve thinking to things like staff engagement, or customer trust, or Net Promoter Scores, or ‘value demand’, or how productive they’re able to be during a working day, or quality improvement programmes, and a disconnect occurs. When enterprises try and improve how much customers ‘trust’ them, nothing will happen unless there is a system to make it happen. Admittedly it will be a complex system. That’s complexity as in the mathematical sense – something else we’ll dig deeper into later on too. Things like ‘trust’ are emergent properties of complex systems. Everything feels like it effects everything else, and usually in unpredictable ways. That may be so, but it’s a system nonetheless. It may not give us the level of trust we desire, but if it doesn’t, the reason it hasn’t is because ‘the system’ has hit the top of the s-curve. And therefore the vicious cycle. And the contradiction.

Again, as we’ll see shortly, there are multiple strategies and methods for revealing which vicious cycles and contradictions are causing you to be stuck at the top of your own curve. One of the simplest, however, requires us to ask just two simple questions. Question 1, what are you trying to improve? Question 2, what’s stopping you? If you can answer those two questions, you’re well on your way to being able to tap into the nine million and some other people that have been in the same place before you, and successfully found a way of solving the contradiction and thus jumping their system to its next curve.

That, ultimately, is how the world of change works. Someone creates a system. They optimize it. They get stuck. Someone solves the contradiction. This creates a new s-curve. Someone then optimizes that s-curve. They too eventually get stuck. Then someone comes along and solves their contradiction. Looked at through an s-curve lens, the world looks something like this:

Figure 2 S-Curves & Alternating Innovation/Optimization Cycles

It’s a picture that should tell us that there are times in life when optimization is the right thing to be doing, and there are other times when our job becomes solving contradictions. It’s not an either/or. Things like Lean and SixSigma have a very definite place in life. When we’re looking to optimize the system (climb the curve), they probably help do the job better than anything. When we’re looking to jump curve, we need to put those methods on one side and pick up others. Solving contradictions means we need tools for solving contradictions. Most people assume there is no such toolkit. The Business Matrix is an attempt to show them such tools do exist. When we’re stuck at the top of our current curve, we no longer have to accept the fact that we’re stuck.

Some people think that this process of discontinuously jumping from one s-curve to the next is called ‘innovation’. In our terms, they’re probably right. Innovation is all about people that have made a discontinuous jump successfully.

But because s-curves are literally everywhere, some discontinuous jumps are bigger than others. Almost everyone will recognise that the jump from land-line to cellular telephony was a step-change. When we zoom in and look then at, say, the jump from handsets with keypads to those with touchscreens, that was more about ‘optimization’ than innovation. Even though it very definitely, when we look closely enough, involved a discontinuous jump. Zoom in further and we can see that Apple only entered the touchscreen world when the technology allowed the user to do something more than point at something on the screen. We all know that the way to make text bigger or smaller on our smartphone screen is to use two fingers that we either move apart or together. That looks even more like ‘optimization’, but it was, again, if we zoom-in close enough, another s-curve jumping step change. Step- change, in other words, is in the eyes of the designer. If you were a keypad designer, touchscreens were a whole world away from anything you knew. Likewise, if you were designing screens with that allowed you to recognise where on the screen the user was touching it, that was a world away from someone that had worked out how quickly the user was moving their finger could give a whole new set of benefits. S-curves are literally everywhere. All we need to do to find them all is work out that they co-exist hierarchically. Some sit at the top of the hierarchy, are global and visible to all, some sit at the bottom of the hierarchy and are only visible to those that look through a progressively finer and finer microscope:

Figure 3 S-Curves Hierarchies

‘So what?’ you ask. You might not care about s-curves. Your job is merely to improve what your boss told you to improve. You might not know that your ability to improve is governed by your position on your current curve. You might not know where you are on your curve. It would be better if you did. Nothing works like understanding how the world works. Maybe the only bit you need to know right now is that if you’re trying to make the improvement, and every time you do something prevents you… something like this you’re at the top of your curve, you’re caught in a vicious cycle, and if you really want to go back to your boss with an actual improvement, your only alternative right now is to solve the contradiction.

Figure 4 Corporate Whack-A-Mole & Contradictions

History & Evolution Of The Business Matrix

Like nearly all major discoveries, the concept of a Contradiction Matrix emerged by accident. When an engineer in the Soviet Navy began searching through patent documents in 1946 (Reference 1), he wasn’t the first person to recognise the importance of contradictions. That honour probably resides with the so-called ‘Gang Of Three’ philosophers of Ancient Greece.

Aristotle, Plato and, particularly, Socrates, pontificated seemingly endlessly about the so- called dialectic. Socrates essentially believed that a contradiction was best solved through dialogue, enough of which would eventually determine which perspective was right and which was wrong. It was – and still is – essentially a method of clever questioning aimed, ultimately, at browbeating the weaker opponent into submission. Most modern political and legal systems are still built around this Dialectic Method.

More recently, the German philosopher Georg Wilhelm Friedrich Hegel (1770-1831) took the Gang Of Threes ideas a step further by realizing that sometimes, both sides of an argument can ‘right’ and that the best solution in such cases was to find a higher level ‘synthesis’ solution that allowed both thesis and antithesis to both remain true, rather than have the two opposing sides bludgeon each other into submission. Hegel effectively invented ‘third-way’ politics, but, fair to say, the majority of politicians, lawyers and business leaders still don’t get it. Hegel’s thesis-antithesis-synthesis model, however, at least offered those that were open-minded enough the possibility of actually solving their contradictions.

But it was only in the patent research conducted by Genrich Altshuller starting from 1946 that the true significance of contradiction-solving became apparent. Altshuller was, crudely speaking, tasked with distinguishing ‘good’ patents from ‘bad’ ones. He very quickly saw that the key factor differentiating one from the other was whether the inventor had successfully solved a contradiction or had merely made the usual win-lose trade-offs that everyone else did. Most patents fell into the latter trade-off-method ‘bad’ category. These patents, Altshuller concluded, could safely be ignored. The patents to focus on were the ones where the inventors had decided to persist beyond the trade-offs their peers had accepted and had successfully ‘eliminated’ them. Whenever Altshuller or a member of his team saw such a patent, they started reverse engineering the strategies the inventors had used to achieve their no-trade-off solutions. After a year, they began to realise there weren’t very many of these contradiction-solving strategies, and the foundations of the inventive problem solving method the world now knows as ‘TRIZ’ were born. Not long after that, they realized that inventors in different industries were all effectively solving the same problems and, when they solved them well, they used exactly the same strategies. And so the first Contradiction Matrix was born. It started by building a taxonomy of all the contradicting parameters inventors were trying to unravel, and then, for each conflicting pair of parameters, Altshuller’s team collated all of the different conflict-breaking solutions and their underlying strategies.

Altshuller’s Contradiction Matrix research is today is clouded in considerable mystery and mythologizing. To this day, the original research – insert images of warehouses full of patent documents neatly classified and analysed – has not been made available for scrutiny. What is clear, though, is that by the early 1970s, Altshuller declared that work on the Matrix should cease. Some of his acolytes say the decision was made because the Matrix was ‘finished’ – as in ‘perfect and not to be tampered with any more’ – while others will vociferously argue that the termination occurred because either, a) the basic concept of the Matrix was flawed, or, more typically, b) because it was such darned hard work reading through patent documents to try and reveal the necessary contradiction solving ‘DNA’.

Spool the clock forward, now, to the late 1990s when the Systematic Innovation research team was formed and tasked with the job of ‘updating’ the original TRIZ contradiction research. The work was instigated because attempts to use the 1970s Soviet Contradiction Matrix often proved to be frustrating. Use it to try and solve a mechanical problem and it would usually ‘work’; use it to try and solve a semi-conductor problem, or a pharmaceutical problem, or a problem in any of the ‘modern’ industries and it would usually either point problem solvers in fruitless or nonsensical directions. The overall concept of ‘find-the- contradiction-solve-the-contradiction’ seemed more and more valid the more problems we worked with clients on, it was the detail contained within the Contradiction Matrix that was wrong. By 2003, working in conjunction with some of the key members of Altshuller’s team (Genrich Altshuller had sadly passed away in 1998), and adding close to a million additional patent analyses, it was possible to publish a completely new version of the Matrix (Reference 2). Matrix 2003 had a slow start across the TRIZ user-community – it took the academic community, and a fairly peripheral element of the community at that close to a decade to confirm that the new Matrix was superior to the original. By which time the Systematic Innovation research team, now aided by some smart semantic search software, had added several million more patent analyses and had published Matrix 2010 (Reference 3). Nowadays, search technology means we can effectively build an in situ, bespoke Matrix on the fly, albeit, this is in no small part made possible by the stability of the 2010 version of the tool.

Meanwhile, in parallel with all of this work on the ‘technical’ version of the Contradiction Matrix, the team had also been working on a hypothesis that the concept of contradiction- solving was also highly relevant in the world of business, and that, as with technology, the best business solutions were ones in which the creators successfully challenged or eliminated trade-offs and compromises. At first – through the last three years of the 1990s – we were trying to confirm our, we now know, naïve belief that when business leaders and entrepreneurs ‘solve contradictions’ they would be using a whole bunch of different strategies to the ones used by technologists. At the end of this piece of work, the conclusion was that solving ‘business contradictions’ used precisely the same set of Inventive Principles that were used to solve ‘technology problems’. And, we later found, the same applied to IT, architecture, music, literature, politics, you-name-it, it’s the same basic 40 Principles. Now, even though the search continues, it feels like we’re somewhere near the end of the road. Much as we might like to re-structure and re-label Altshuller’s 40 Principles, it doesn’t look like we’ll ever find a 41st one.

So much for the strategies for solving business contradictions, next up we needed a taxonomy for defining the sorts of contradictions those working in the world of business were working on. A first version of that taxonomy – a 31x31 Matrix – was first revealed to the world in 2001 (Reference 4). It was built around 100,000 case study analyses. Where patents had been the main source of data for the technical tool, the equivalent in the world of business, turned out to be the management text book. Or, more rightly, the academic business literature out of which management texts tend to get spawned.

By 2004, we had sufficient verification and validation evidence from a brave lead community of Business Matrix users to justify expanding the research. Again, as in the world of technology, the decision was made easier through the emergence of semantic search technologies that allowed us to analyse lots of literature in a relatively short amount of time. We re-issued a new version of the Matrix that year. The 31x31 taxonomy still seemed to be somewhere about right, so the new Matrix – published in the first edition of Hands-On Systematic Innovation for Business & Management (Reference 5), one of our ongoing best- sellers – was mainly about adding more data. 100,000 case studies had grown to a shade over quarter of a million.

And that near-enough brings us up to the present day. Research to keep adding new data to the Business Matrix has continued since 2004. In the most recent decade of this search, two phenomena have stood out. The first is the increasing level of dysfunction of the business literature ‘industry’ where, unlike the world of patents, copyright laws are a far less effective means of preventing authors from re-inventing the same wheels as earlier authors. Which is to say, the way things seem to work these days is once in a while, someone has a really useful insight. They write a paper about it. Then a book. Then, if competing publishers recognize the magnitude of the insight, they go find other authors to go and write their own version of the same basic story. So-called ‘Design Thinking’ is a classic case at the moment, with, at the time of writing, something like 1500 titles available on Amazon. All of them containing the same basic (contradiction-solving) insight that Edward De Bono wrote about in the late 1960s. Frustrating for prospective readers, and a potential minefield for the Systematic Innovation research team in terms of training our search tools to connect the newly invented words and phrases publishers tend to encourage, back to the original problems and solutions. This first phenomena, in other words, boils down to how well we can all see-through the publishing industry noise and get to the meaningful signal.

The second phenomena has been more interesting in terms of evolving the Matrix. Back in 2004, the world of business – at least in terms of how businesses were taught to be managed – was very much about tangibles. ‘What gets measured gets managed’ being the aphorism of choice for many middle-managers (and perhaps even more so, their bosses). Accountants and economists ruled the roost. If the economists said stand-up, everyone stood up. And then the 2008 GFC happened, and we all started to realise what our guts (and W. Edwards Deming) had been telling us for a long time, ‘the most important numbers are unknown and unknowable’. Business success, in other words, was increasingly all about the intangibles. It was about how much your customers (and your employees) trusted you. It was about our innate human desire for autonomy, belonging and desire to feel competent. The more this realization struck home, the more attention intangibles have received. In 2004, there was no repository of knowledge we could go and analyse to see how someone might have solved, say, an autonomy-versus-risk contradiction, but by 2010, we realized, there was enough of it to at least contemplate adding such ‘unmeasurable’ parameters into the Business Matrix taxonomy. By 2012, we’d worked on enough client projects to learn that things like autonomy and trust are in actual fact eminently measurable (hence our spin-out of the ‘PanSensic’ measurement tools), and, not long after that, that we could use those measurements to create and reverse engineer a statistically significant number of case studies to meaningfully populate a Matrix tool with this extended taxonomy. And so, here we are, with a new 45x45 size version of the Business Matrix – our ‘3.0’ version of the tool. A bigger, much more ‘intangibles’ focused tool and a lot more data, with, today, over three- quarters of a million business-focused case studies – thanks in no small part to a still increasing propensity for US business to at least attempt to patent their contradiction-solving business models and concept innovations. And thanks too, finally, to the recently released PanSensic ‘Contradiction Finder’ tool – a semantic narrative search tool that will automatically scrape through swathes of text (email traffic, social media, business literature, etc) to identify not just the conflicts and contradictions that people are talking about, but also, how they’re (occasionally – the business world still isn’t so good at this kind of ‘third- way’ stuff) able to deliver a contradiction-solving breakthrough solution.

Data Acquisition Methods

Since the first days of TRIZ, the process of building the Contradiction Matrix tools has involved reverse engineering millions of case studies. Once the decision was made to build a Matrix for business and management problems, the reverse engineering challenge increased considerably. The process is fraught with difficulties, the main one of which is complexity. Success – however such a thing might be defined – is an emergent property of a complex system. And in the world of business, where everything is increasingly connected to everything else, success becomes ever more fleeting. ‘If you always do what you've always done, you will always get what you've always got’ is still an oft used aphorism in business. In the context of complex systems, however, it is a potentially very dangerous way to view the world. Just ask the 400+ enterprises from the original Fortune500 of 1955 that no longer exist. They all failed because they steadfastly continued doing what had made them successful, even though the world around them had changed.

Even the most cursory of glances at The Halo Effect (Reference 6), one of the most disruptive management texts of the last twenty years, will tell readers that attempts to decode the reasons for the success of an enterprise very easily fall foul of mythology, ego and a mis-reading of a situation by outsiders. I’ve had much experience of the same problem when working with many Systematic Innovation clients over the last couple of decades. When Jack Welch was in charge of GE he (in)famously told the world that the Company had saved $9B as a result of deploying SixSigma. No-one in the Company, however, has ever been able to show me any of this money. What I have seen, on the other hand, is an internal recognition that attributing the success of your latest project to SixSigma was good for your career. And so – surprise, surprise – any and all kinds of success managed to have a SixSigma-did-this label attached to them. On no occasion, though, was there ever a project in which SixSigma was compared with any of a thousand-and-one other methods of thinking about system improvement. In other words, while I don’t doubt that GE has many breakthrough successes through and beyond Welch’s tenure, we should be extremely wary about any attempt to pin the success down to a ‘root cause’.

One of the key distinguishing attributes of any complex system is there is no such thing as a ‘root-cause’ of any emergent characteristic or feature. Success – or failure – emerges instead from a ‘conspiracy of causes’. Take away any one of these contributing ‘causes’ and there would be no success. Or rather, what would emerge would be something very different.

Success in a complex world can be very fleeting. A conspiracy of causes that lead to extraordinary non-linear growth one day can lead to abject failure the next. That’s why it can be highly dangerous – indeed why most management texts are dangerous – because they have fallen into the trap of reverse engineering a temporarily successful enterprise, have abstracted an apparent root-cause success formula and presented it to the world as some kind of universal panacea. Look at how Deming Prize winners uncannily fall off a cliff not long after they win; look at how many of the ‘great’ enterprises in Good To Great (Reference 7) stopped being great after Jim Collins wrote about them; look at how faddish twelve-step programs come and go (or how twelve steps has shrunk to six or four or, in the case of Net Promoter Score, one).

You can never step in the same river twice. What worked for one enterprise probably won’t work for another. Even though they might look superficially ‘the same’.

The situation sounds hopeless. If it’s really true we can never step in the same river twice (it is), we should never hope to be able to decode the success of one enterprise and hope to be able to transfer it to another. Fortunately, the original TRIZ researchers found something important. They didn’t understand complex systems, but when we combine what they learned with what we now know about complexity, we end up with the foundations on which we have a chance of understanding universal patterns of success. It all comes down to the aforementioned s-curves and specifically the sequence of vicious cycle at the top of the current curve creating the opportunity for bifurcations. The right combination of bifurcation and environment then creates a new virtuous cycle that in turn allows the new solution to prevail and eventually supersede the old system. At least for a while… until the next (inevitable) vicious cycle kicks into play.

The vicious-cycle-bifurcation-virtuous-cycle sequence is all about contradictions. Emergence of contradictions, emergence of a ‘root contradiction’ and the eventual resolution of that contradiction. The right – i.e. universally transferable – research to do, therefore, is looking for contradictions and how enterprises eventually resolve and eliminate them.

This gives us at least the start of a research formula: look for a non-linearly successful entity; look for the contradictions that got solved in order to create the virtuous cycle driving the non-linearity; look for how the contradiction was solved.

Here are a few examples of what that process looks like in practice:

The Geography Of Genius: Once in a while, you find yourself in the presence of an author that understands complexity and how to track down the reasons why systems can occasionally enter a period of non-linear growth. Eric Weiner (Reference 8) is one of those people, and his book The Geography Of Genius is a rattlingly good read. If you ever want to see what non-linear dynamics and the transient nature of success looks like in reality, you need look no further than this book.

On one level it is a study of why, out of all of the cities and regions on the planet trying to be run successfully, the world occasionally throws up an Athens, or a Hangzhou, a Florence, an Edinburgh, a Vienna, or a Silicon Valley.

Places that – for a fleeting moment – become a melting pot of change and innovation. It’s then also a look at why they stop being successful. But more than both of those things, it’s an attempt to understand at a first-principles level what are the unifying features of each of these regions. From a contradiction-finding perspective, the book is in effect all about one (root) contradiction: the desired emergent property was innovation and the thing that normally prevents it from happening – at least at a regional level – are the inherent difficulties to try and manage the right emergent outcomes. Abstracting this problem onto the terms of the Business Matrix, The Geography Of Genius is all about an Adaptability- versus-Control Complexity conflict. Having found the right problem, the next part of the reverse engineering process the SI team needed to work out was how each of the cities or regions successfully overcame the contradiction. Weiner’s final diagnosis is that in each case the success emerged from what he described as ‘3 D’s’: disorder, diversity and discernment. Respectively, when we interpret the intended meaning of each of these D’s, we find they correspond to Inventive Principles 13 & 25 (disorder), 40 (diversity) and 21, 23 and 29 (discernment). And thus we have several entries that can be added to the tally for the Adaptability-versus-Control-Complexity box in the Matrix. One book, one contradiction, 6 Inventive Principles.

Zappos: The Geography of Genius is something of an exception to the usual business text rule: someone who understands complexity and focuses on one problem. I suspect most business books are sparked by a hypothesis that turns into an article that grabs the attention of sufficient readers that a publisher comes along and says to the author, ‘any chance you could turn that into a book?’ the answer to which is usually, ‘yes, let me go and find a few cases that kind of fit my hypothesis’. Needless to say, it’s usually difficult to glean anything of value from such models. A subset of this model is the organization that successfully goes through a period of non-linear growth and gets approached directly by the publishers: ‘please could you write up your recipe for success?’. To which the answer is almost invariably, ‘yes’, since most CEOs have big egos. One such success (I can’t say anything too specific about ego, but I have my theory) is the online retailer Zappos. Prior to their acquisition by Amazon for $1.2B in 2009, Zappos achieved something that 99% of on-line retailers have thus far failed to do: make money. The Zappos CEO, Tony Hsieh, was convinced to write the book, ‘Delivering Happiness’ in 2010 (Reference 9). When we read through it, we could see that Zappos had found a good contradiction to solve – ‘we want to increase customer revenues, but it’s difficult to make a decent margin when your route to market is virtual’ – but it wasn’t especially clear how the problem had been solved. Fortunately, when organisations become spectacularly successful, lots of outsiders start swarming to see if they can discern the secret elixir. Most of these didn’t help either. The Halo Effect seemed to be shining brightly. It wasn’t until we hit upon the book Holacracy (Reference 10) that we felt we really got to the crux of the contradiction’s resolution. Actually, first up it gave us a clearer insight into the actual contradiction, by revealing this quote from Hsieh: ‘Zappos is growing, we’ve reached fifteen hundred employees, and we need to scale without losing our entrepreneurial culture or getting bogged down in bureaucracy’. Thus the contradiction deepens, it has now become (in the terms of the Matrix) a Customer Revenue versus Adaptability/Versatility conflict. Having found a good problem, it then becomes important to look for evidence of step-change solutions that help to alleviate or eliminate the conflict at hand. Also in the Holacracy book, we find the story of the Zappos call centre operator that received a call from an apparently distraught customer who, having the week before bought a pair of shoes for her father, indicated that her father had passed away just after the shoes arrived and could she have a refund. Now, I’m not sure what you’re thinking when you read that story, but I know when I’ve spoken to friends and colleagues that have had occasion to frequent call centres, they’re more than skeptical about the sincerity of the caller. What the Zappos operator purportedly did is not only agreed the refund for the shoes but also, without asking a supervisor, organized a bunch of condolences flowers to be sent to the customer. The point here is not whether the story is true or not, but that it exists as a story. Stories tell us a lot about the culture of an organization. More importantly stories tell people inside the organization what the values of that organization are. And now we’re somewhere close to a ‘first principles’, ‘DNA’ level understanding of whether and how the contradiction has been solved. The story is about Inventive Principles 2 (Take Out the command and control), 7 (Nested workgroups – thanks to Holacracy for that one!) and, most important of all, 33 (‘do unto others as you would have them do unto you’).

3D-Printing: Once in a while, the whole contradiction story takes a 180degree turn. Sometimes the world generates terrific solutions that open up the possibility to solve multiple contradiction problems. One that is doing exactly that is 3D printing, or perhaps more generically, ‘additive manufacturing’. The shift from traditional ‘subtractive’ to additive manufacturing is an illustration of a classic Principle 13 solution – turn the system the other way around. It is also, to all intents and purposes a technical solution. Which seems to imply a degree of cheating to some people in the business community: ‘how can you use a technical example to illustrate a business method?’ seems to be the gist of the question. To which the answer is, ‘it might be a technical solution, but it is a solution to a host of business problems. The artificial boundaries we seem to instinctively draw between different disciplines after a century of dominance by the specialists of the world are purely in our imagination. The issue as far as the Business Matrix is what business contradictions is additive manufacturing a solution to? When we look at successful deployments of the new way of doing things – aerospace, medical devices being two dominant areas, we can establish that the contradictions being solved include Production-Capability-versus- Adaptability, Production-Cost-versus-System-Complexity, Production Time-versus-Design- Specification. And so those are the boxes within the Matrix where Principle 13 is added to the running total of Principles found as solution strategies for that particular combination of improving and worsening features.

Magic Roundabout: A bit more difficult to track down, but many of the best contradiction resolving solutions are ones that never got formally written up and published as a case study in a business text book. One of my favourite examples is the so-called ‘magic roundabout’ design found at several locations in the UK where there is a legacy infra-structure problem with multiple roads converging onto a point. The traditional solution to such situations is to construct a roundabout. Roundabouts are a good solution, because they are self-organising (Principle 25) in the sense that every individual driver decides when it’s safe to enter the roundabout. Put enough traffic into the system, however, and eventually gridlock will occur.

Or at least it used to do prior to the realization of the roundabout-of-roundabouts idea (Principle 7). The contradiction being solved here, in business terms is the fight between the desire for more flow (Production Capability) and the parallel desire to avoid complicated control systems such as traffic lights (Control Complexity). There’s an argument here again that this is a technical problem with a technical solution, but hopefully the real point is that if the improving and worsening features can be mapped onto the Business Matrix – which they have been – then the case study is a valid one. If that doesn’t satisfy the more skeptical readers, then we might also look a level deeper at this problem. Whenever I show the image of the roundabout in countries outside the UK the usual reaction is one of, ‘that can’t be right’. When they see videos of cars travelling around the roundabout in both clock-wise and counter-clock-wise directions the reaction becomes somewhat stronger. Imagine you’re the chief roads planning officer for Swindon council – the place where the first magic roundabout was tried – and someone comes to you with the idea for the first time. Not only does the idea look wrong, but there’s no proof that it could be right. In this scenario there is a much deeper contradiction that needs to be solved, one that gets right to the heart of human emotions and intangibles, how to convince someone to try something new (Design Risk), when there is no tangible evidence it works (Amount Of Information) and it looks so counter- intuitive ((in)Competence)? Answer? The initial set up was designed as a classic (complex systems) ‘safe to fail’ experiment (Principle 27). The roundabout is merely paint on the road; if it hadn’t worked, it could have been painted back to the original form in a matter of hours. As it happens, there was no need for that as not only does it flow considerably more traffic than the conventional design, but it’s also significantly less prone to traffic accidents. Which tells us about another Inventive Principle being used – Principle 13 again – the best way to make people behave in a safe manner is to ensure their out of their ’unconscious competence’ thinking mode, and the best way to achieve that is to make them feel ever so slightly unsure about what they’re doing.

Figure 5 Magic Roundabout, Swindon

US9,418,383: In theory at least, one of the best sources of contradiction-solving case studies are patent databases. In a typical week in the US – where business patents are ‘allowable’ – there will be several hundred newly granted patents pertaining to business issues. Admittedly, many of these are weak (according to our IP quality measurement tool, ApolloSigma – Reference 11), but even if 85% of the patents go straight into our trash-can, that still leaves a substantial number of cases per week to potentially add to the database. By way of an example, US9,418,383 was granted to State Farm Mutual Insurance in August 2016. One of the nicest parts of using the patent databases of the world as a source of case studies, is that inventors are supposed to describe the problem they have solved. Here’s what we learn from the US9,418,383 background description:

“Insurance customers typically buy a policy for a fixed amount of time and for particular coverage. For example, insurance customers apply for insurance by submitting to an evaluation of past or contemporary vehicle, driver, and other conditions and behaviour. The insurance company then evaluates these conditions to determine a risk of loss for the insurance company. The customer then pays a policy premium fee to bind the insurance for a period of time, typically six months, which is based on the determined risk of loss. A higher fee is based on a higher risk of loss, and vice-versa. If, during the insured time period, the customer experiences no loss incidents, the customer may have an opportunity to renew the insurance policy at a lower premium. Thus, any benefit for the customer in reducing the possibility of loss incidents (i.e., engaging in risk-reducing behaviour) occurs upon renewing the policy.”

Finding the contradiction requires a little bit of unravelling, but when we do that job, and map it onto the parameters of the Matrix, we see a conflict between the desire on the part of State Farm to improve the flexibility (Adaptability/Versatility) of their pricing being inhibited by the fact that traditionally insurance policies are only renewed on an annual basis (Supply Time). In terms of how the Company has solved the problem, we need to look elsewhere in the patent document. Usually the Claims section. Where, in this case we’re told:

“A computer-implemented method for providing disincentives to an insured customer during the term of an insurance policy, the method comprising: receiving, via a computer network, sensor data from at least one sensor, the sensor data (i) including data that measures a set of characteristics of an operating insured vehicle, and (ii) sent by the at least one sensor in real time during operation of the operating insured vehicle; accessing vehicle conditions data including data related to an environment at a particular location; once the sensor data is received from the at least one sensor: determining, based on the vehicle conditions data, that the operating insured vehicle is operating at the particular location, and determining, based on the vehicle conditions data and the sensor data, that the insured customer is engaging in risk-increasing behaviour; calculating a risk score for the insured customer, the risk score based on the risk-increasing behaviour engaged in by the insured customer; determining, by a processor, a disincentive action to execute for the insured customer based on the risk score; and executing, by the processor, the disincentive action.”

Which, when we plough through the legalese and map the inventive steps onto the taxonomy of Inventive Principles we see evidence of Principles 15 (Dynamics), 23 (Feedback), 35 (Parameter Changes – i.e. the sensors – which, on deeper reading turn out to be wireless, and making use of the ‘cloud’). And again, we have three more entries to add to the Adaptability-Supply-Time box.

And there we have it. Repeat these kinds of analysis 750,000 more times and you have the Matrix that unfolds before you.

That’s as far as the story goes for the Contradiction Matrix. For the sake of completeness, every case study we look at goes through a more comprehensive process of analysis and mapping on to the wider Systematic Innovation methodology frameworks and databases. Here’s what that broader process consists of for each patent, journal paper or business text book we deem worthy of analysis:

1 look up pulse rate of relevant industry

2 identify evidence of failure or success plus or minus one/two pulses

3 look for evidence of trend jumps (Evolution Potential – Reference 5) and/or contradictions solved (in practical terms, these days, we know that if neither of these has happened, it won't be a successful solution, so this is actually the easier and better test)

4 If 3) is positive, look for evidence of new trends or trend jumps, reverse engineer the contradiction and add to Matrix, new Principles? new function database entry? New Inventive Standard? (Reference 12)

5 If the attempt is a failure: classify the type of failure (wrong solution, wrong problem, inadequate coordination, route to market, means of production, wrong measurement) in order to keep the overall failure rate statistics up to date.

6 If the attempt is a success: does the success make sense in terms of Voice of System matching Voice of Customer matching Voice of Execution - if it doesn't, does the model need to change/evolve? (Reference 5)

Figure 6 summarises the overall process:

Figure 6 Overall Business Innovation Search Strategy

A detailed description of the overall strategy can be found in Reference 12, but a few important points are discussed here: First, the start point of the analysis is to examine every incoming piece of ‘new’ content. Anyone who has spent any time looking at patents or read more than their fair share of business texts will have very quickly learned that there is a lot of information that – to put it kindly – has little of value to contribute to mankind’s greater well-being. Statistically, around 95% of business texts end up with large proportions of the first (and only) edition being pulped. Around 97% of patents never pay back the cost of filing the patent. On average we reject about 85% of books, papers and patents after establishing the Quality of Invention, thus focusing on extracting knowledge from the top 15%. There is a significant possibility of missing important material by rejecting this proportion of information. We minimise this risk through the use of in-house semantic search strategies and developed metrics (relating things such as length of claims, number of certain keywords found within claims, number of citations and time from submission to grant). These have evolved to become highly effective filter tools.

By archiving the actual words used by the inventor (rather than just the generic Parameter names) it becomes possible to re-arrange the data to suit different definitions of the Parameter names. This is something that may be utilised by different industry sectors who want to possess a Matrix specific to their own terminology.

As discussed earlier, there is often a degree of uncertainty over the specific conflict pair an inventor or author has sought to tackle – for example if the inventor is attempting to solve multiple problems. In these situations, the strategy is to place details of the invention in all of the Matrix boxes that appear to be relevant. This multiple placement of solutions within the Matrix ensures that users will obtain the highest quality recommendations, as the uncertainties we have deciding where to put a particular invention are exactly the same as the uncertainties users will face deciding which conflict pair is most relevant to their problem. By including the uncertainties during the data input stage, an imperfect selection by a user will still identify Inventive Principles that have been used to successfully challenge ‘similar’ situations.

As a final test of the validity of the Matrix recommendations we have had an ‘expert panel’ test each individual box. For each conflict pair at least two specific case studies are generated. For each of these cases, the expert panel brainstorms through the 40 Inventive Principles in order to generate as many solution options as possible, These are then evaluated with a view to identify which of the ideas gave the ‘best’ solution strategy. ‘Best’ is defined as those solution concepts that contained the most significant ‘wow’ factor, or presented the most elegant solution. On average it has taken around 4 hours to go through this process for each box in the Matrix. Multiply that number by the number of boxes (just short of 2000), and you obtain an indication of the overall level of effort that has been expended to create the tool in its latest form.

Intangibles

And so we reach the heart of the step-change realised between the second edition of the Business Matrix and this third one: intangibles. We’d known since we started using the J.P. Morgan aphorism, ‘a man makes a decision for two reasons: a good reason and a real reason’, back in the late 1980s that you can’t hope to truly solve a people-related problem unless you bear in mind the feelings and emotions of those people with a stake in the problem. This was around the time a lot of business books were declaring, ‘don’t take it personally, it’s just business’. All our instincts (and experience managing large teams) told us that any attempt to separate business and what people felt about business was doomed to failure. We knew too, shortly after beginning our TRIZ journey that the absence of intangible factors was a big limitation on our ability to sensibly make use of the toolkit in a ‘business’ context. The problem at that time was that there were very few visible examples of businesses and business leaders seeking to bring emotional factors into play during their problem solving activities. So there was no real ‘database’ of examples to draw from. And certainly no database of ‘intangible-related’ contradictions we might use to begin populating an expanded Business Matrix. It wasn’t even possible to construct with any kind of clarity what emotion-oriented parameters we should try and build into the ‘improving’ and ‘worsening’ dimensions of the Matrix. The best we were able to do in fact, if you look at either the first or second editions of the tool was to bundle all of the ‘emotion’ problems into a category called ‘tension/stress’.

The first breakthrough appeared when we started connecting the J.P. Morgan aphorism to the TRIZ ‘function’ pillar and pioneered the ‘Outcome Map’:

Figure 7 Prototype Outcome Map

Half of this Map was about forcing to think about intangibles: firstly what are the intangible outcomes desired by the individual customer and then what are the ones desired by the people around that individual. We knew from our work with pioneering clients in this ‘intangibles domain (largely FMCG and tourism industry enterprises) that it wasn’t possible to go and ask these people about the intangible ‘stuff’ directly. There’s no question, for example, a marketing person can sensibly formulate to ask a prospective customer, ‘how cool do you want to be?’ Or, ‘how much do you want your friends to look up to you?’ We all know these elements are present to some extent whenever people are present, but how many of them need to be taken into consideration? Are there thousands of emotions that need to be thought about, or a handful?

It was time to get back to first principles. In classic TRIZ, ‘someone, somewhere already solved your problem’ mode, it didn’t take long to find Reference 13. Deci & Ryan’s work tells us that our core human emotion drivers are Autonomy, Belonging and Competence: parallel desires to be in control of a situation, to be part of the ‘tribe’ and to be able to demonstrate to ourselves and others that we are ‘good at’ whatever we’re doing, respectively. Then came David Rock’s SCARF model (References 14 and 15). Then, really getting back to the first of first principles, Edward Matchett tells us that ‘Meaning’ is the ultimate human driver (Reference 16). And so we ended up with the ABC-M prototype:

Figure 8 Autonomy-Belonging-Competence-Meaning (ABC-M) First-Principle Human Behaviour Drivers

Now we had a foundation, not just for doing a more comprehensive job of helping problem solving teams to ‘complete’ their Outcome Maps, but also for a taxonomy of parameters we needed to include in this 3.0 version of the Business Matrix.

Once we knew ABC-M were important, we knew we had to find ways in which to identify and measure them. That’s where our spin-out company, PanSensic now comes in to play. PanSensic (Reference 17) is all about measuring what’s important rather than what’s merely easy. Most organisations, we quickly saw when we started going to visit enterprise executives in order to understand what they’d ‘really like to know’ about the world around them, had fallen into the latter trap. It’s easy to measure whether the train left the station on time; it’s much more difficult to give a commuter live information about the quickest way to get to their intended destination, but only the latter is of any use.

The other frequently heard responses to the ‘really like to know’ question are the other parameters you will now find in the ‘Intangibles’ cluster in the Matrix: Sense Of Progress, Trust, and Engagement. And then there were a large number of other parameters that we hear a lot less frequently. These are things that we’ve had to cluster together in a final pair of parameters, ‘Positive Intangibles’ and ‘Negative Intangibles’. We were forced to do this, too, because its far less easy to find a critical mass of case studies to enable inclusion of a new parameter. One imagines that as the research continues, future versions of the Matrix will see these two ‘catch-all’ categories disappearing and being replaced by a more granular list of parameters. Except, by that stage, we envisage that the Matrix software technology will have evolved to the point where users will not have to concern themselves with the parameters at all since a software tool will directly identify contradictions and conflicts and offer up some immediate Inventive Principle solution directions (see the final chapter of the book for more details of this evolution trajectory).

Meanwhile, for the last three years, we have had our own research version of a PanSensic ‘Contradiction Finder’ and so the process of finding case studies has increased in speed by two orders of magnitude. Consequently, it has been possible to take ‘obscure’ conflicts between, say, Autonomy and Engagement, set the software off trawling through social media looking for examples of where this conflict is occurring, and then allow the researcher to dig deeper and see when and, more importantly, how managers and leaders are successfully solving the conflict to create breakthrough solutions. As the software gets better at doing this translation-to-solution job itself, we expect the rate of case study mapping to increase by another exponential leap.

There’s an oft used expression in China: ‘when all else is equal, you buy from your friends,’ which later concludes, ‘when all else is unequal, you still buy from your friends.’ Business, in other words, is largely dominated by the intangible factors. J.P. Morgan was right, we do make decisions for two reasons, but it’s the (intangible) real reason that sets the whole story in motion.

Using The Matrix

Getting Started

If this is the first time you’ve seen the Business Matrix, the usual easiest place to start familiarising yourself is with the fold-out sheet that accompanies the book. This format of the Matrix has been around, largely unchanged since the 1950s. The two dimensions represent two questions: ‘what are you trying to improve?’ and ‘what’s stopping you?’. The left hand side of the sheet shows a column describing 45 different Parameters that other problem solvers in a business and management setting have tried to improve. They’ve been clustered into a number of different categories: things that are important during the ‘Design’ part of a system; things that are important during ‘Production’; then ‘Supply’, and ‘Support’; then a cluster that all relate to the ‘Customer’; then ‘Systems’; then ‘Intangibles’; then a small cluster relating to things that are important when we’re trying to measure things, and finally, a pair of Parameters that relate to ‘Harmful factors’. We’ll discuss the details of these 45 Parameters in more detail as we get into the heart of the Matrix. For now, it’s sufficient to note that you’ll see the same clusters and the same 45 Parameters listed across the top of the Matrix. We look at this list when we’re trying to identify the things that are stopping us from improving whatever it is we’re trying to improve.

The basic idea, then, is that in order to make use of the Matrix, we need to have thought of two things: what am I trying to improve and what’s stopping me. This allows us to find the right row (improving Parameter) and column (worsening Parameter) in the Matrix, and look at the box corresponding to the place where the row and column intersect.

By way of a simple example, let’s say that our current problem involves us trying to improve Market Demand for our products and services, but we’re lacking Feedback from those Customers. To look this conflict up on the Matrix, we look down the list of improving Parameters until we reach row 22, and then look across the list of worsening Parameters until we reach column 23. Then we look at the intersection of this row and column and find the numbers 4, 33, 27 and 13. These numbers represent a ranked list of the Inventive Principles used by others to successfully challenge this particular conflict. Principle 4 being the most frequently used strategy; 33 the second most frequently used strategy, 27 the third and 13 the fourth. Having obtained these numbers, we can shift our attention to the table on the very right hand side of the sheet. This table lists the 40 Inventive Principles. It’s where we’ll see Principle 4 is ‘Asymmetry’, 33 is ‘Homogeneity’, 27 is ‘Cheap, Short-Living’ and 13 is ‘The Other Way Around’. Then, if we’re not sure what these labels mean, we can turn over the sheet and look at the expanded explanation of each of those Principles. And if that doesn’t help, we can head into the final Section of this book to see a list of examples for each of the Principles.

The bulk of the content of the book is basically, then, an expanded version of what you’ll find on the fold-out sheet. Each row across the Matrix effectively becomes a pair of pages in the book. So, in order to make use of the book, we first need to identify the Parameter we’re looking to improve and find the pair of pages relevant to that Parameter. Then, within that pair of pages is a table containing all of the worsening Parameters and the ranked list of Inventive Principles. The reason for using the book over the fold-out sheet is that the additional space available allows us to offer a longer list of Inventive Principles for each Improving-Worsening Parameter combination, provide a detailed description of what each of the Parameters means, a list of synonyms, and a number of additional features that will become apparent as we get further into the details.

Conflicts

The above example of the tension between Customer Demand and (lack) of Customer Feedback is what we will call a ‘conflict’. Other expressions we might hear people use include ‘chicken-and-egg situation’, conundrum, paradox, and, perhaps most common of all, ‘trade-off’. We use the ‘trade-off’ expression a lot because life conditions us to expect to have to make trade-offs. And, sure enough, for most of our lives that’s exactly what we have to do. Between the time your alarm-clock went off this morning, and the time you left the house to go to work, as we hinted earlier, the likelihood is that you’ve drifted through over a hundred trade-offs (check out Reference 18 if you don’t believe us). The reason for that is your primary focus was efficiency and not innovation. We experience trade-offs all the time, and for most of that time we have to live with it. Indeed, not only this, but the world has given us dozens of methods, tools and strategies to help us to make the trade-offs work as best as they can for us. We tend to call these strategies ‘optimization’ because this sounds like a good thing to do. And, of course, it’s definitely better than not optimizing, but it is ultimately about making the best of a bad job. Ideally, we wouldn’t have to make a trade-off at all. When we sit down with a deliberate intention to design a better way of doing things, this is exactly what we should be doing. We no longer have to abide by the rules of trade-off. Or, we don’t provided we accept that there are indeed ways of solving conflicts in a ‘win-win’ fashion. This is what the Matrix is all about: a collection of all those people that refused to compromise and instead designed a solution in which they achieved the best of both worlds.

Conflicts are all around us. The easiest way to make them visible, is to ask the pair of conflict questions, ‘what am I trying to improve?’ and ‘what’s stopping me?’ If the answer to the second question is ‘nothing’, there is no conflict; if there is an answer, there is a conflict.

The next simplest way to identify conflicts is to look at spreadsheet data or graphs. A conflict will always look something like this when drawn on a graph:

Figure 9 Graphical Representation Of A ‘Conflict’

What’s happening in a conflict is that as we attempt to improve one parameter the other one gets worse. A classic example would be supply and demand. Or risk-versus reward. Pairs of parameters that enterprises devote inordinate amounts of time attempting to ‘optimize’. Because that’s what we do… until we realise there’s a better way.

The next problem is that everyone’s problems are unique to them. Or at least that’s what we all think. What the Business Matrix research revealed was that, at a certain level of abstraction, we’re all working on the same problems. We’re not the only people in the world that have experienced the conflict between wanting to increase Customer Demand and not being able to do it because of a lack of Customer Feedback. Mapping this problem onto the Matrix is easy because we can quickly see both of these parameters are featured among the 45 Parameters that make up the side and top of the Matrix. But what happens when our problem is more specific? What happens when we’re managing a team of Marketers through a change process to encourage them become more responsive to changing market conditions, and we’re not getting any buy-in because the new tools we need to teach them come with an unfortunate learning curve? Where are these parameters on the Matrix? There is nothing labelled ‘marketing change’ and neither is there anything about ‘learning curves’. To use the Matrix to tap into how others before us have solved this conflict, we’re going to have to do a bit more thinking. We need to abstract our problem before we can tap into the successful solutions of others that have been there before us.

(By the way, it is worth noting that when the SI research team is examining these previous successes, they have the same abstraction job to do. Only in reverse: whenever we see an organisation solving this change-versus-learning-curve conflict, we need to work out where to put their solution in the Matrix so that future problem solvers facing their version of the same conflict can find it easily.)

The abstraction process is all about finding words in the list of 45 Parameters that ‘mean the same’ as the words that we use to describe our specific conflict situation. The overall process looks like this:

3) Use Matrix to obtain Inventive Principles

2) Translate specific terms to generic Parameters

1) Define problem in terms of improving versus worsening features

4) Translate generic Inventive Principles into specific solutions

Figure 10 Conflict Abstraction Process

The first job is involves describing our conflict in our specific words. Next we translate this specific situation into the ‘generic’ by finding words from the Matrix Parameter-list that are equivalent. Once we’ve done this job, we look-up the Inventive Principles at the intersection between the appropriate row and column in order to identify the ‘generic solutions’. This is the list of the top 4 or 6 Inventive Principles used by others to solve the conflict. This just leaves us needing to do the final job of converting the generic solutions into the context of our specific situation. This final job is usually the most time-consuming, and the one that fundamentally demands that we bring to bear our existing domain knowledge. An outsider to the problem will usually find it easy to do the first three jobs; the insiders will tend to be best at translating specific solutions into the local context.

It’s often easiest, when we start using a new way of thinking, to make use of a template. We’ll introduce and describe such a template in the next section. In the section after that, we’ll have a look at a simple worked example:

Conflict Abstraction Template (CAT)

The template mimics the sequence of events described in Figure 10, except it is now expressed as a linear flow, starting at the top and working down through each of the boxes to the bottom. Here’s what the usual CAT looks like:

Figure 11 Conflict Abstraction Template (CAT)

The top row of the template is where we’re expected to write down the initial specific problem statement. The left-hand box is for describing the thing we’re trying to improve, and the right-hand column is for describing the thing preventing us from achieving the desired improvement. Importantly here, the job is to describe the problem statement in our own words and in a way that would be meaningful to anyone else that might be a stakeholder.

The next row is where we record the results of our abstraction job. What we’re trying to do in this pair of boxes is find the closest equivalent words from the list of 45 Matrix Parameters to the words we’ve written in the first row. We need to make the abstraction for both our improving and our worsening parameter. A frequent danger during this abstraction process is to over-think the conversion. The more we look at the list of 45 Parameters, often, the more connections we will find ourselves making to the specific conflict statements we’ve written down. There’s nothing wrong with making all of these connections, but we will tend to make life easier for ourselves if we make the most literal connections possible. ‘Do these words mean the same as these ones?’ is the simple but effective test we should be employing.

Once we’ve done that, we can now do the easiest part of the process and look up the Inventive Principles present in the box(es) in the Matrix corresponding to our chosen improving and worsening Parameters. The third row of the CAT will essentially just be a list of numbers. These numbers are our ‘generic solutions’ – a ranked list of the strategies used by others to solve the conflict most like ours.

Finally, then, we come to the last row of the CAT. This is where we start the process of translating the generic solutions into ones that are relevant to the context of our specific situation. The template labels them as ‘clues’ at this stage. This is to emphasise the idea of making as many connections as possible between the Inventive Principles and solution directions that might help us to solve our specific problem. This final box in the CAT is the biggest one. The idea being that here’s where we’re going to be doing the most writing. At this stage, the more solution clues we can derive the better. There are few if any ‘silver bullet’ solutions to an kind of business problem. Far more likely is that our eventual answer will be derived through a judicious combination of the clues that we’ve been generating.

So much for the theory, let’s see how it might look in practice. To do this we’ll dig a little deeper into the afore-mentioned Marketing Department responsiveness improvement initiative and the learning-curve conflict…

Conflict Case Study

Completing the first row of the CAT is relatively in this case since we’ve already described the problem in the previous section. Here’s what it looks like:

Original Specific Problem thing we want to improve:

Original Specific Problem thing that stops us/gets worse:

Figure 12 Top Row Of The CAT for Responsiveness Versus Learning Curve Conflict

Completing the second row requires us to identify Parameters within the list of 45 featured in the Matrix that best match these two boxes. Let’s start with the left-hand side and our desire to improve the responsiveness of the Marketing Department. There’s no Parameter in the list that specifically mentions ‘responsiveness’ so we need to find the closest match we can. ‘Adaptability/Versatility’ on row 28 looks like a pretty good match. So does ‘Support Time’ on row 18. Examination of the list of synonyms for both further reveals that either could be appropriate. We could choose, therefore, to include both of them in our translation. If we wish to explore a little further into the difference between ‘versatility’ and ‘time’ we might conclude that the former is closer to the ‘responsiveness’ statement we’ve started with. Regarding ‘time’, there was nothing in our initial problem definition about the absolute amount of time it’s taking the Marketers to respond. This might cause us to go back and re- think our initial problem statement: is it actually the amount of time we’re taking that’s the issue? In this case, because we don’t have time to communicate all of the contextual details of the problem, we’ll make the decision that it is row 28 and ‘Adaptability/Versatility’ which best corresponds to our improvement desire and so that’s the one we will write into the CAT.

Next up, we need to find Matrix Parameter equivalents for the ‘no buy-in’ and ‘new tool learning curve’ issues preventing us from realising the desired responsiveness improvement. This looks like a more challenging job. Maybe ‘Support Capability’ (row 16) is a match? Or how about (thinking specifically about ‘learning curve’) ‘System Complexity’ (row 29) or ‘Amount Of Information’ (row 25). Or, shifting our focus to the intangible Parameters, maybe what’s stopping us has something to do with Autonomy (row 33) – i.e. everyone likes change, but very few like to be changed – or Competence (row 35). The latter is a phenomenon that affects all of us when it comes to learning new stuff – when we’ve never seen something before, there’s an almost inevitable first feeling that we are incompetent.

Again, we could choose any and all of these Parameters in our analysis. We’d need more information about the context of the problem to make a fully representative match, but one thing we do know for certain is that when we’re dealing with people the J.P. Morgan aphorism about people making decisions for two reasons comes in to play. We might go so far as to say that every people conflict actually contains two conflicts: the good conflict and the real conflict. The ‘good’ conflict is the tangible part of the problem. In this problem, we might conclude that ‘System Complexity’ is the closest match to our situation. The ‘real’ conflict is all about the intangible parameters, and, as far as this situation is concerned, ‘Competence’ feels like a good match to make.

If we decide to take both the ‘good’ and ‘real’ Parameters, it will mean the top two rows of our CAT will now look like this:

Figure 13 Top Two Rows Of The CAT for Responsiveness Versus Learning Curve Conflict

Important to note, perhaps at this stage is that if it turns out we’ve chosen our generic Parameters ‘incorrectly’, the worse that will happen is that we’ll generate some Inventive Principle solution directions that don’t generate answers we like. We can always come back to this stage and try some of the other Parameters that we have ignored this time around.

Experience watching thousands of novice users, however, suggests that the problem is not a big one. This is because the Matrix has been designed to be ‘self-correcting’. What that means is that the uncertainty we might have in mapping from our specific to the generic is exactly the same uncertainty the SI research team faces every time they’re looking to add a new case study to the Matrix. Our strategy in such situations, if we’re not sure which box to put a case study into, is to put it in multiple different boxes. You’ll see how this works should you adopt an approach of looking up multiple boxes for a different problem and begin to observe the same Inventive Principles being selected from different boxes.

Anyway, lets stick for the moment with the decision we’ve made here to look up two Parameter – one ‘tangible’ and one ‘intangible’ – on the worsening side of the Matrix.

The next job is easy. We need to look up the relevant row-column intersection boxes in the Matrix. The next Figure shows the result of doing this for our current case study:

Figure 14 Completed Third Row Of The CAT for Responsiveness Versus Learning Curve Conflict

Now comes the exciting part of the process. Well, ‘exciting’ if the hard work of generating lots of solution clues is what you enjoy doing. Again, as far as this case study is concerned, the following solution clues are probably only meaningful in the context of the specific case study. If you happen to be interested in those specifics, let us know and we’ can provide more details. If you’re not interested in the specifics, but are interested in the process, the main things to note in this next solution-generation activity are, firstly, the idea of generating as many ‘clues’ as possible, and then, secondly, converging on an ‘actual’ solution. We’ll see this diverge-converge cycle in several other places in the Business Matrix and indeed when we’re working on any kind of complex problem. As far as this case study is concerned, we’ve deployed our standard heuristic of generating ‘at least five’ clues for each of the Inventive Principles suggested to us by the Matrix. Which means 45+ things written down in the fourth row of the CAT:

Principle 5 – Merging

• Working-together teams

• Peer group training

• Integrate ‘learning’ into KPIs

• Learning ‘hackathon’

• Merge training into annual conference/weekly meetings

Principle 25 – Self-Service

• Team organise their own training

• Team works out who’s going to learn different topics then take it in turns to teach others

• Some people teach better than others; allow the team to work out for themselves who’s going to teach what

• ‘Commanders Intent’ strategy – empower individuals to work out how they get there

• Podcast/’listen-anywhere’ materials

• Tie-up with local University – accredited training?

Principle 15 – Dynamics

• ‘sense of progress’/easy steps training design

• Allow individuals to learn at their own pace

• Allow individuals to design their own curriculum based on strengths/weaknesses

• Recognise that individuals have different times/places/formats they learn best

• Flexible schedule Principle 21 – Skipping

• Lunchtime ’10-minute’ training injections

• ‘state of the nation’ call to arms

• ‘bootcamp’/SAS short-sharp shock

• Find low-hanging-fruit quick wins

• ‘Walk a mile in my shoes’ customer exchange days

Principle 28 – Emotional Fields

• Tap into peoples’ need for autonomy – let them control when they do what

• Create sense of Belonging, ‘no-one left behind’

• Create ‘common enemy’ to get alignment within team

• ‘Buddy-system’ training

• Bring extended families into change programme/family-get-togethers

Principle 27 – Cheap, Short Living

• Rapid-learning cycles

• ‘fail fast, fail forward’ cycles

• Playing cards/fortune-cookies learning

• Training ‘game’/rapid simulations

• Get team to calculate ‘pulse-rate’ of industry to they work out needed rate-of-change of procedures

Principle 20 – Continuity Of Useful Action

• Guarantee we keep doing what is currently working

• Continuous-learning – get people to understand that new-learning is always going to be a need and not a one-off initiative

• Team KPIs

• Emphasis on Meaning and focus on meaningful customer outcomes

• ‘lifelong learning’ meme

Principle 37 – Relative Change

• Focus only on the things that have changed – some things are still stable; some have changed

• Tie the training to changes in ongoing/future customer outcome needs

• Build in generational shifts into the training

• Take account of inter-generational differences

– some generations work better than others with different ages

• Future scenario exercises to demonstrate current protocols don’t work in future realities

Principle 13 – The Other Way Around

• ‘failure of the week/month’ – reward heroic learning efforts (culture shift)

• Tell people they ‘can’t’ have access to learning – create pull rather than push

• Explore previous Marketing failures to improve new training/tools

• Objective measure of training shortfalls so we only teach what people don’t already know

• We know what’s changing, get the team to work out what will still be the same in 5 years/10 years’ time so we can build some level of stability

Principle 35 – Parameter Change

• Virtual learning modules

• Online/distance learning

• Training as an (internal) service?

• ‘subliminal’ training

• Multi-media training modules

Figure 15 Completed Fourth Row Of The CAT for Responsiveness Versus Learning Curve Conflict

Generating as many ‘clues’ as possible (‘diverge until it hurts’) during this phase of the process is largely to ensure an emphasis on quantity of ideas as opposed to quality. Quantity necessarily comes first, quality comes later. Once we’ve done the divergent ‘quantity’ job, the final job, and the final row of the CAT is where we think about quality and home in on our ‘actual’ solution. This convergent job is largely about clustering ideas and themes and combining ‘partial’ ideas into something that offers us a step-change advance on the conflict. Or, better yet, eliminates the conflict altogether. Again, only the specifics of your own context and your own problem will allow you to know whether this aim has been achieved. If it hasn’t, then check out the last section of this chapter, ‘Around The Loop Again’. Meanwhile, as far as a close-out for this case study is concerned, Figure 16 illustrates our final ‘convergence’ work and the much smaller range of answers we proposed to our client:

Figure 16 Converging On The ‘Solution’ To The Responsiveness Versus Learning Curve Conflict

Physical Contradictions

Conflicts – the tension between two different attributes within a system – are the primary working medium of the Business Matrix, but they are not the only type of trade-off mechanism that the Matrix needs to be able to deal with. The second type is what the TRIZ world refers to as ‘physical contradictions’. These are the situations where the tension lies within a single parameter: we want the enterprise to be ‘big and small’. We want big batch sizes and small batch sizes. We want to centralise and de-centralise. Physical contradictions are present every time we find ourselves trying to optimize the value of a single parameter. What’s the optimum level of risk? Optimum interest rate? Optimum range of services? Optimum amount of information we should give to employees? Optimum class size? All important questions to think about in an Operational Excellence context. And consequently an awful lot of attention gets paid to establishing what these optimum values are. Lots of hard work, that is all nugatory when we consider that there’s no such thing as an optimum anything in a complex world. Optimum values depend on local context. Sometimes the optimum class size is one; sometimes it’s a hundred. There can never be a single, universal, unchanging optimum. Any attempt to find one is the opposite of innovation- thinking. In innovation thinking, we want the best of both worlds, and therefore, it’s a good idea to identify where we are trying to optimize a parameter and instead of then doing the optimization calculations, formulate it as a physical contradiction.

A big reason for wanting to do this is – another big finding from our research over the last twenty years – whatever your contradiction turns out to be, someone out there has already found a way of solving it. Every physical contradiction we can find – same as every conflict pair – is an innovation opportunity. Physical contradictions are everywhere. We can see them most clearly when we encounter graphs like this:

Figure 17 Graphical Representation Of A ‘Physical Contradiction’

Having identified a physical contradiction, when we try to tap in to the breakthrough solutions of others using the Business Matrix, we quickly encounter a problem: look up the problem, ‘I want to give customers lots of information (improving feature) and little information (thing that’s stopping me) and we encounter an empty box. Indeed the whole diagonal line of boxes, from the top left to the bottom right of the Matrix is full of empty boxes. Clearly, this part of the Matrix tool is not going to help us when we have encountered a Physical Contradiction.

Without wishing to put a damper on things, when we look at how those before us have successfully solved their versions of our Physical Contradiction, we’ll see they used the exact same range of 40 Inventive Principles we’ve already encountered when we were looking at the range of solution strategies for solving conflicts. What we’re missing, so far, for Physical Contradictions is a means of prioritising which of the 40 are most likely to help in our current context. This is the next question we need to answer…

Separation Strategies

The key to solving Physical Contradictions involves identification of contextual conditions that allow us to separate the various different ‘ideal’ values of the Parameter under consideration. Take the idea of class size in schools: the ideal class-size when the teacher is tutoring a student struggling to grasp a context is ‘one’. On the other hand, if its time for band practice, the ideal size is likely to be ‘the whole band’. Once I understand the contextual difference between these different situations, I can ‘solve’ my Physical Contradiction by separating them. When I have a struggling student, I have a class size of one; when I’m rehearsing the orchestra, I have a class size of 100. In this case, I separate the two contradicting requirements of big-class and small-class at different times.

In this latest evolution of the Physical Contradiction resolving story (Reference 19), there are three main strategies available, each one involving a different type of separation strategy: separation in space, separation in time and separation between interfaces. As such, the strategies mimic one of the pillars of TRIZ in that the Space-Time-Interface theme occurs throughout the innovation and creativity stories. Each strategy benefits from some in-depth thinking about what attributes might be amenable to separation before we allow ourselves to transition to the Inventive Principles and a solution-generation mode of thinking.

Here’s how that in-depth thinking works: firstly we need to think about each of the contextual condition types and look for differences between where, when or how we desire one extreme of the contradicting parameter and where, when or how we desire the other extreme. If we are able to identify such conditions within a given category, then we know we are able to exploit a separation solution strategy consistent with the space, time or interface categories.

On one level, looking for conditions that allow us to separate our contradictory requirement is all about looking for resources. As such, the resources may well be very specific to our particular situation. Using ‘band practice’, for example, as one of the conditions that allows us to separate the class-size contradiction is very specific to the education sector and would be very unlikely to be of assistance to a problem solver trying to solve a Physical Contradiction relating to the insurance industry. That said, having been on a resource-hunt with several thousand different client projects now, it has been possible to construct a Table of generic separation resource triggers. The current version of the Table is reproduced here:

Separation in SPACE

Sub-System, System, Super-System Micro, Mini, Macro, Meta

Individuals, Team, Department, Division, Business Unit Office, Town, Region, Country, Continent

Supplier, Customer, Consumer, Complementor, Competitor

Coordination, Sensor, Engine, Transmission, Tool, Interface

Innovation Capability Maturity: L1, L2, L3, L4, L5

Separation in TIME

Past, Present, Future

Second, Minute, Hour, Morning/Afternoon, Day, Week/ Weekend, Month, Season, Year, Decade…

Exploration, Design, Production, Supply, Support, Return Divergent, Convergent

Stage-Gate 1, 2, 3…

Process step A, B, C….

Sustaining, Disruptive, Breakthrough, Tipping-Point Trigger, Inflated-Expectations, Trough, Enlightenment Slope, Productivity Plateau

Denial, Anger, Depression, Bargaining, Acceptance

Separation by INTERFACE

Autonomy, Belonging, Competence, Meaning Parent, Adult, Child

Survival, Tribal, Feudal, Order, Scientific, Communitarian, Holarchy, Holistic

Prophet, Nomad, Hero, Artist

Fear: Trepidation, Nervousness, Anxiety, Dread, Desperation, Panic, Horror, Terror; Anger: Annoyance, Frustration, Exasperation, Argument-ativeness, Bitterness, Vengefulness, Fury; Disgust: Dislike, Aversion, Distaste, Repugnance, Revulsion, Abhorrence, Loathing; Sadness: Disappointment, Discouragement, Distraughtness, Resignation, Helpless-ness, Hopelessness, Misery, Despair, Grief, Sorrow, Anguish; Enjoyment: Sensory/Pleasure, Rejoicing, Compassion/Joy, Amusement, Schaden-freude, Relief, Peace, Fiero, Pride,

Naches, Wonder, Excitement, Ecstasy

Table 1: Physical Contradiction Separation Strategy Trigger List

Readers already familiar with TRIZ or our TrenDNA (Reference 20) work will recognise some of these resource clues. Included in the Separation by Interface row of the table is a ‘comprehensive’ (Reference 21) list of human emotions. These are all potential sources of contradiction resolution – e.g. tackling a contradiction like, ‘we want to give people bad news and we don’t want to give people bad news’ is potentially very solvable if we know the right emotion states to tap in to. Like not giving bad news when recipients are feeling anxious or desperate.

More often than not, once we realise we have identified a condition that allows us to successfully solve our contradiction, we don’t need to go any further into the process. The trick to solving the problem was ‘merely’ identifying and unlocking the right separation resource. That said, in many cases, too, having found a separation resource still leaves us some way away from having an actionable solution.

The Venn diagram illustrated in Figure 18 shows the means by which we might best make this final jump from separation strategy to Inventive Principle solution suggestions:

Figure 18 Translating Separation Strategy Into Inventive Principles.

(readers will also find this diagram reproduced on the back of the accompanying fold-out sheet).

The recommended method of using the diagram involves identifying which, if any, of the three separation strategies is possible (asking ‘can the contradictory requirements be separated in space?’, ‘can they be separated in time?’, ‘can they be separated by interface?’). For each strategy where the answer to this question is yes, that tells us which segment of the Venn diagram to look up the relevant Inventive Principles. Thus, for example, if we determine that we can separate our bad-news/no-bad-news contradiction in Time and by Interface, the Inventive Principles we should start to look at to help generate solution clues are 15, 34, 11, 36, 29 and 16.

The sequence of the numbers in each segment of the diagram is important and relates to the relative frequency that each Inventive Principle has been used to solve that particular type of Physical Contradiction. Thus, for example, in the above example, Principle 15, Dynamics, is the most frequently used strategy; Principle 34, ‘Discard & Recover’, is the second most frequently used, and so on. As with the Business Matrix itself, the overall idea when we allow ourselves to enter the solution-clue generation part of the process is to generate as many clues as possible for each Principle.

Also worth noting regarding the structure of the diagram is that if we are unable to find solution clues that appear to resolve the contradiction in the segment we start with, we can then start shifting to other adjacent segments. Thus, in the bad-news contradiction, if Principles 15, 34, 11, 36, 29 and 16 don’t give us what we want, we might head next to the segment where Principles 10, 19, 21, 9, 18 and 20 are found (i.e. we know we can use Separation in Time as a solution strategy) or to the segment where Principles 24, 12, 23, 6, 32, 8, 38 and 39 are found (i.e. we also know we can use Separation by Interface as a solution strategy). Basically, as with most things in life, we persist until we get what we want.

Eventually, of course, we’re going to end up looking at all 40 Inventive Principles. As with the conflict situations represented by boxes in the Business Matrix, it is always possible to simply use the 40 Principles as means of generating ideas for any type of conflict or contradiction problem. The Matrix and this physical contradiction table offer more systematic approaches (and thus efficient short-cuts) but they are not compulsory.

Physical Contradiction Template

Figure 19 illustrates how the latest Physical Contradiction thinking has been assembled into a template:

Figure 19 Physical Contradiction Template (PCT)

The left and right hand sides of the template will be familiar from the preceding discussion. The list of Space-Time-Interface resource triggers is printed on the left in order to help problem solvers to have a check-list to refer to. The Venn diagram on the right-hand side is for use once we’ve established which, if any, of the three available separation strategies might be relevant to our current situation.

The centre portion of the PCT is the ‘new’ part. It is the bit where we will be filling in details as we progress our thinking on the Physical Contradiction problem at hand. Figure 20 zooms-in to look just at this centre portion of the template:

Figure 20 Physical Contradiction Template (PCT) – Centre Portion

Per convention, we start at the top of the PCT. The first thing we fill-in is the parameter relating to our chosen Physical Contradiction. Line two then requires us to define the two extreme ends of the Contradiction – ‘we want high interest rates and low interest rates’ for example. After this, we get to the real heart of the template. The next three rows are where we’re looking to identify conditions whereby we might be able to separate our contradictory requirements. The three rows represent the Space, Time and Interface categories of separation strategy. If we can identify anything in any of the three categories, we record what we’ve found in the relevant boxes. Finally, when we’ve finished thinking our way through the three different separation categories, over on the right-hand side of the template is a final column labelled, ‘Y/N’. This is where we simply record whether we’ve been able to identify a candidate separation strategy in each of the three categories. Once we’ve done this job, we can look over to the Venn diagram, look-up the relevant Inventive Principles and record them in the bottom-right-hand corner of the Figure 19 full version of the PCT.

Physical Contradiction Case Study

To hopefully transform the abstract into something more concrete, we will conclude the Physical Contradiction solving discussion with a worked example. The problem with nearly all case studies is that they’re specific to a particular situation and unless a reader is fully aware of the surrounding context they can come across as overly generic. The best hope – we think – is to start with a case study that many readers are likely to be familiar with to some extent or other…

…with that in mind, it is widely known these days that there is an almost universal problem with any innovation project, and that is the decisions that get made in the first days and weeks cost almost nothing in relation to the eventual cost of the project, but by the time those early decisions have been made, a very high percentage of the eventual project cost will have been committed. The range of this commitment is typically 70-90%. With that in mind, one might expect that organisations might devote more effort and more resources during those early days in order to help ensure that later spend can be reduced due to a lowered need for re-work and problem rectification. This is what one might expect, but somehow it rarely happens. Perhaps the reason ‘the designer casts the biggest shadow’ (Figure 21) problem is a Physical Contradiction, and when innovation teams start saying to their managers, ‘we need the upfront resources to be high and low’, their words are likely to result in nothing more than furrowed brows and further reinforcement that innovators are aliens from a different planet.

Figure 21 The Designer Casts The Biggest Shadow

Having now seen that this issue is indeed a Physical Contradiction, we can begin filling in the top portion of the PCT as follows:

Figure 22 Top Portion Of PCT For Upfront-Resource Contradiction

Now we can start thinking about whether we might be able to identify any resources that might be brought to bear to help separate the contradictory ‘high’ and ‘low’ requirements. We start with separation in Space, where we need to think about where we want the two different ends of the contradiction.

Looking at the Space category check-list on the left of the sheet, highlighted the Innovation Capability Maturity Model (ICMM) (Reference 22) trigger. This reminded us of the fact that it is really only ICMM Level 3 and above enterprises that actually understand what resource types are needed during the first ‘fuzzy-front-end’ days and weeks of a project. Putting more resource into this fuzzy-front end when teams don’t know what sort of questions they’re supposed to be asking and answering would simply be a waste of that resource and we’d be no better off than we would have been had we done what we usually do. Having found that there is a possible separation-in-Space possibility, we can put a ‘Y’ in the relevant column on the right of the template. (We could and probably should, by the way, continue to explore other separation in Space possibilities to draw up a more comprehensive list – everything we can find potentially helps us to solve our Contradiction.)

For the sake of brevity, we will look next at the Time category check-list, the separation possibilities will come from thinking about when we want our high and low upfront resources. The most obvious connection is likely to come from the realisation that it is during Exploration work (i.e. working our what we don’t know) that large numbers of people could be useful to us. If the project is not doing Exploration – for example if it is a simple, ‘sustaining innovation’ project, then having a large team will not add value. So, again, we have identified that separation-in-Time is possible and hence can put another ‘Y’ in the relevant box.

The third separation category option is Interface. Here we’re looking for all the other ‘if’ conditions that cause us to want our high or low upfront resource. The connection we picked up this time, using the check-list on the left of the template, is about Competence, and particularly the competence in the concept of Decision Flow (Reference 23). If the team is not familiar, then putting lots of upfront resource to bear on the project is a good idea. If the team is not familiar with Decision Flow, that additional resource would be wasted. Having found a separation-by-Interface possibility, we can add a third ‘Y’ to the right hand column.

And now we’re ready to make the transition to our first set of Inventive Principles:

Figure 23 Final PCT For Upfront-Resource Contradiction.

Finding three potential separation strategies should immediately allow us to start conceptualising solution strategies to the high-low upfront resource contradiction. Teaching the team about Decision Flow for example, or bringing on board a collaboration partner with the requisite ICMM skills. Now we can start adding some additional solution clues as might be triggered by our list of Inventive Principles:

Inventive Principle 2 – Taking Out.

• Remove Gantt charts & replace with monthly task map

• Ensure everyone has some ‘skin in the game’ (take out ‘passengers’)

• Remove hierarchy (let this emerge or create later)

• Remove vacations, overtime – reinforce that this is temporary ‘bootcamp’ situation

• Make visible and remove prior Assumptions Inventive.

Principle 35 – Parameter Change

• Virtual noticeboards

• Virtual ‘Vision Board’

• Virtual ‘what we don’t know’ board circulated around rest of organisation

• Virtual prototype (possible to expose to customers extremely quickly for early feedback?)

• ‘Fuzzy-Front-End Team’ as a service?

Inventive Principle 3 – Local Quality

• Allocate people according to different type of unknowns

• Noisy and quiet project ‘War Rooms’

• Different functions take lead on different days/weeks

• Establish which contradictions and assumptions are more important to be challenged than others

• Informal and Formal reviews.

Inventive Principle 5 – Merging

• Bring on board collaboration partners with requisite ICMM skills

• Bring in coaching consultants with requisite exploration skills

• Regular (daily) feedback meetings

• Co-located, cross-functional ‘Fuzzy-Front-End team’

• Invite ‘peripheral’ players to participate (virtually).

Inventive Principle 37 – Relative Change.

• Focus on changes in this project relative to previous equivalents

• Establish whether prevailing sector step-change pulse rate has changed

• Project ‘Contradictions Found’ noticeboard

• ‘Unknowns Answered’ dashboard

• PanSensic Engagement/Morale/Trust/etc dashboards

• ‘Sense Of Progress’ dashboard.

Inventive Principle 4 – Asymmetry

• Authority/voting-rights based on different levels of ‘skin in the game’

• Asymmetric day schedule – make use of knowledge that different times of day are better/worse for doing creative work, consolidation work, etc.

• ‘Big problems first’

• ‘Failure of the week’/biggest learning

• Red Team/Blue Team split (Red Team has 10% of resources and the job of trying to put Blue Team solution out of business – permission to be radical)

Trilemmas

So much for conflicts and physical contradictions. Both represent different types of dilemma. Anyone that’s spent any time picking up battle-scars in a real business setting will know that their world is full of ‘iron triangles’. Or trilemmas. Project managers, for example, have an expression which goes something like, ‘cost, quality, schedule: which two do you want?’ It’s easy, in other words, for any manager to ‘solve’ the conflict between cost and quality by compromising on schedule. Achieving all three together is nigh on impossible. Or at least it is when thinking about a situation with an Operational Excellence mindset. When we’re thinking in this way, we take account of our local context and work out which of the three elements of our trilemma are more important than others. If we look at theatre or film- making, for example, schedule dominates (no-one ever misses their ‘opening night’), costs are fixed and so quality is the thing that ‘has’ to be compromised. Sometimes the compromise will be bigger than others. So, to take an extreme example, film director Woody Allen can be seen to have produced some of the best and also some of the worst films in cinema history. But he never overspends and always delivers the film on time. Schools and universities are the same: term time is fixed, budgets are fixed and so quality of education given to students becomes the ‘variable’.

Conversely, the aerospace and other industries where safety is paramount, aren’t able to compromise on quality and so, depending on the prevailing economic conditions either let costs escalate (usually military programmes, where schedule – i.e. defence of the nation – is vital) or schedules become ‘fluid’. We often see a similar set of outcome biases in the healthcare sector.

So, what should we do in these kind of trilemma situation? One way of thinking says that we treat the trilemma as a pair of dilemmas: solve one, and then solve the second one. That’s certainly a valid approach. The other way is to make use of a template we’ve been using for a number of years now and colloquially call the ‘Bubble Map’. This template also solves another problem for us. And that’s the connection between conflicts and physical contradictions. Some (in the TRIZ world at least) will argue that the Physical Contradiction is the ‘ultimate’ problem definition. Others will argue that conflicts are more visible and therefore allow problem solvers to tap into more of the solutions of others. The Bubble Map tells us that conflicts and Physical Contradictions are directly analogous: if we have identified a conflict pair, we can always convert it into a Physical Contradiction. And if we’ve found a Physical Contradiction, we can always convert it into a conflict.

The conversion process works like this:

If we have identified a conflict pair, we convert to a physical contradiction by thinking about what is required in order to achieve the two parameters that make up the conflict.

If we have identified a Physical Contradiction, we convert to a conflict pair by thinking about the ‘because’ reasons we want each of the two sides of the Contradiction.

Let’s dig a little deeper with the Cost-Quality-Schedule iron-triangle introduced earlier:

One Physical Contradiction we can configure says we want Cost to be ‘high and low’. We want it to be high because that helps ensure we get high Quality; we want it to be low because that helps ensure we minimise Schedule.

Conversely, we can start with the conflict between Quality and Schedule, and state that high Quality requires Costs to be high, and low Quality requires Costs to be low.

We can then rotate each of the three parameters such that they each can be expressed as the Physical Contradiction:

We want Schedule to be long because that helps ensure we get high Quality; we want it to be short because that helps ensure we minimise Cost.

We want Quality to be high because that helps ensure we get best (whole-life and safety) Cost; we want it to be low because that helps ensure we minimise Schedule.

We could draw all three using the same basic Bubble Map elements like this:

Figure 24 The Cost-Quality-Schedule Iron Triangle Expressed As Three Bubble Maps

We could proceed to break the iron-triangle by tackling any one of these three starting definitions. Within each, we could solve the conflict or the Physical Contradiction. Or both. Or, we can recognise that each of the lines connecting a pair of Bubbles describes a conflict or contradiction. Solving any one of them may offer the potential to break the triangle; solving two almost inevitably does.

But, have we really ‘solved’ the triangle? In some instances, depending on the three parameters that make up the trilemma, absolutely yes. In this particular Cost-Quality- Schedule trilemma, all three issues will still be present when we’ve finished. Our hope in ‘solving’ the conflicts and contradictions here is that we make a step-change in the right direction.

‘Right direction’ is a more difficult concept. Except in TRIZ, we know that all successful systems evolve in the same basic direction to the same end destination: things will be Free, Perfect and Now. This is what TRIZ defines as the ‘Ideal Final Result’ (IFR). It’s intended as a theoretical compass heading rather than a tangible business goal, but that said, organisations like Google and other ‘virtual’ service providers appear to live the philosophy of this IFR end-state in that most of their ‘customers’ will never give the Company any tangible money, and will still receive a ‘perfect’ service delivered instantaneously – think, for example, about how rarely your use of the Google search engine rarely goes beyond the first page of hits these days, and how it reminds us every time we conduct a search that it has found several million hits in a tiny fraction of a second.

‘Free, Perfect, Now’ is the evolutionary end state of the Cost-Quality-Schedule iron-triangle. And every time we ‘solve’ a conflict or contradiction between the three parameters we make a step-changing jump in the direction of that end-state. In that sense, it perhaps hints at something we might usefully add to our Bubble Map…

‘Bubble-Map’ Template

…Figure 25 illustrates the generic version of the Bubble Map, integrating a new bubble on the left hand side to represent the ‘missing’ connection to the Ideal Outcome state. The main idea behind including this bubble is to encourage users to think about their overall compass heading. Less obviously, what it also does is offers up two more conflict solving opportunities such that if the four relating to the four bubbles on the right-hand side of the Map ‘cannot’ be solved, two back-ups are on hand to try: one between Conflict Parameter 1 and the Ideal Outcome; and the other between Conflict Parameter 2 and the Ideal Outcome.

Figure 25 Bubble Map Template.

If you examine any of the work-books of any of the SI team members, you’ll see Bubble Maps drawn everywhere. The human brain has a very strong desire to jump as quickly as possible out of problem definition mode and into solution generation, and this is almost always a mistake. The large majority of innovation attempts fail on day one because the team has jumped to an erroneous conclusion about what the problem to be solved is. If nothing else, the Bubble Map is designed to trigger some tough problem definition thinking before we allow ourselves a release into the (usually much more fun) world of solution generation. The greater the struggle to make sense of the Map (or Maps), the more likely it is that when we emerge through the other end of the struggle we’re much clearer on what needs to be done than if we’d simply made a few assumptions about what the real problem to be solved was and jumped semi-randomly into solution generation mode.

As with most things, the best way to bring the Bubble Map to life is to show a worked example. Interested readers will no doubt find several dozen such case studies in the archives of the Systematic Innovation e-zine (References 24, 25, and 26 offer three by way of a starter). Here’s one to that allows readers to see the story all in one place:

Trilemma/Bubble-Map Case Study

This case follows a statement made during a client session that we thought ‘Getting To Plan B’ (Reference 27) was one of the best business books of the last decade. We were approached during one of the coffee breaks by one of the team members. He didn’t look happy. The gist of his unhappiness was that our suggestion was likely to adversely affect the morale of his team. ‘If we’re not all bought in to the project,’ he said, ‘it will all collapse around us. We need to know everyone is aligned and heading in the right direction, not looking around for excuses or diversions.’

It sounded like we’d found an interesting contradiction. We could see his point, but we could also see that Mullins and Komisar, the authors of ‘Getting To Plan B’ had built their hypothesis on some pretty solid foundations. Namely, that in a complex world, there’s an awful lot that can’t be known at the start of the project, and thus it is highly advisable to allow for course corrections as and when new information emerges during the course of filling in the unknowns.

The contradiction seemed to look something like the picture reproduced in Figure 26:

Figure 26 We Want A Plan B and We Don’t Want A Plan B Contradiction Map

Having constructed the picture, we reminded ourselves – with no little irony as it turns out – that another favourite management text book of ours, ‘Scuttle Your Ships Before Advancing’ (Reference 28) was in complete alignment with the words of my irate client team member.

The titular section of the book is built around the story of famed explorer Hernando Cortez. He landed on the shores of Vera Cruz, Mexico in 1519 and wanted his army to conquer the land for Spain. Immediately upon landing it looked like Cortez faced an uphill battle; an aggressive enemy, brutal disease and scarce resources. As they marched inland to do battle, Cortez ordered one of his lieutenant’s back to the beach with a single instruction: "burn our boats."

It was a brave way to make sure the army kept their eye on the goal. Burning boats was a really excellent means of eliminating a Plan B retreat.

So which is the right strategy?

The Contradiction Map, of course, makes it clear that the answer is ‘it depends’. Or rather that, ideally, we want the best of both worlds. Be totally aligned with Plan A, and have a Plan B. Figure 27 illustrates the results of mapping the Figure 26 problem onto the Matrix+ contradiction wizard – a piece of software that simultaneously looks up all six of the conflicts and contradictions contained in the Bubble Map.

Figure 27 Ranked Inventive Principle Suggestions For Solving The Plan-B/No-Plan-B Contradiction

Several of the Principles reminded us of an experiment we ran a couple of times during our time working in the aerospace industry. A typical ‘project’ in that world will usually require around a hundred engineers during the initial exploration and design phases of the programme schedule. We decided to place 96 of these hundred engineers into a ‘Blue’ team and the other 4 into a ‘Red’ team. Then gave both the exact same project brief. By rights, the Red team had absolutely zero chance of delivering a sensible design outcome. They were, in effect, our Plan B. Since they had no chance of successfully completing their brief using the established practices and protocols, they would have to break a few rules and try to find better ways of doing things. Their lack of numbers meant that this search for better ways had to fundamentally look for radical step-change solutions.

Both times we ran the experiment, Red Team won. Not that the competition with Blue Team was quite taken that far. The whole idea was to combine the best of both teams: Red found the step changes; Blue delivered the detail. Plan B was effectively built in to the asymmetric team segmentation structure.

I can imagine it’s a strategy that would work in some contexts and not others. I haven’t, for example, found a client willing to live through an equivalent Red/Blue experiment in the last five years. Most likely because the members of Red team need some relatively rare properties in terms of things like resilience and adaptability. Today we might think of them as ‘anti-fragile’. People, in other words, who know the difference between burning boats and burning bridges.

So what about some of the other perhaps less radical strategies prompted by the Inventive Principles suggested by the Matrix?

Principle 19, ‘Periodic Action’, perhaps suggests the slightly less radical idea of periodically switching between Plans at different periods during a project. Maybe having a Plan B Day once a month, for example.

Principle 13, The Other Way Around, could be interpreted as, instead of having one Plan, have lots of Plans with a team responsible for running each. Every team has their ‘Plan A’ and every other team has their version of Plan B. Or, another way or interpreting the Principle 13 provocation would be to initially at least, encourage teams to find as many Plans as they can during an exploration phase aimed at cataloguing and answering the unknowns, and only after that catalogue has been whittled down to a meaningful level of convergence should there be any kind of definition of a boat-burning Plan A. Or, yet another interpretation, organisations like W L Gore don’t rely on a single person to determine what Plan A is, instead they rely on everyone making their own judgement about whether a project is heading in the right direction or not by voting with their feet whether to stay with a project or not.

Principle 28 probably works best in its ‘Another Sense’ context, suggesting in that context something like using another means of getting people into the burned boats level of motivation that doesn’t blind them to the need for exploration of alternatives. Not so fashionable in the last few years, but I know many companies have had success in this direction when they offered project team members a stake in the benefits.

Principle 2, Taking Out, or ‘Separation’ is probably easiest to connect to the idea of taking out any idea of a definitive, boats-burned Plan A until such times as all of the necessary exploration has been completed and the unknowns turned into knowns. This still leaves projects open to the uncertainties of the unknown-unknowns of course, in which case the best thing to ‘Take Out’ is probably time. Fail fast, fail forward being an often relevant strategy when the industry pulse rate is high. Far better to make a Plan A relating to creating a general ability to be able to make rapid iterations than to try and home in on a single all- eggs-in-one-basket project plan. This in effect takes the whole No-Plan-B to a meta level: creating a Plan A to become the world’s best detergent manufacturer is probably going to be out-survived by a Plan A to become the world’s best ‘clean clothes’ business.

Principle 1, Segmentation, offers up a whole series of different segmentation strategies. Segmenting Plan design according to ICMM Level for example, in a special ‘Learning & Innovation’ function or as part of the Efficiency Engine of the enterprise. It could also be segmented according to the psychometric make-up of the project team, the level of risk of the project, or whether the project is intended to deliver a sustaining, radical or disruptive outcome.

We could continue, but hopefully the intended point is already well made. Successful innovation attempts derive from formulating good questions and ‘to have a Plan B or not have a Plan B’ appears to us to be one of them. If only because it forces people to re-train their usually inappropriate innovation instincts. No-one likes burning boats, but sometimes it’s the right thing to do. The key is knowing when. And knowing what the difference between a boat and a bridge is.

Problem-To-Solution Transition Strategies.

1 Connecting Specific Problems to the Parameters

A problem many users of the Matrix (including many with considerable prior exposure) experience is trying to connect the specific words of their problem situation to the generic descriptions offered by the (now) 45 generic Parameters. To ease this problem, a list of synonyms and equivalent meanings has been included in the descriptions provided for each of the Parameters.

Other means of linking of the more obtuse or obscure problems to the Matrix can be found in the final ‘Into The Future’ section of the book, or by using the Contradiction Finder tool at the www.systematic-innovation.com website.

2 Principle Hierarchies

In some situations it is not possible to identify what is getting worse, what’s preventing and improvement to a system, or pairs of conflicting Parameters can’t be found. For people in one of these quandaries, or for those that would simply rather prefer to get straight to the idea generation stage, the new Matrix has included a list of ‘most likely’ Inventive Principles that have been seen to help improve each of the 45 Parameters. If you know what you would like to improve about a current object or system, Business Matrix 3.0 offers an indication of the most likely Inventive Principles to help make the improvement without having to worry about what it is that is getting worse.

This data is provided in the sections marked ‘Inventive Principles that should always be considered for problems where we wish to improve this parameter’ and ‘averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency)’ for each of the 45 Parameters. The difference between the two is that the latter comes from the frequency with which the various Principles have been used by others to give step-change advance solutions to a given problem, while the former emerges from expert panel sessions to identify those Principles that consistently gave the best step-changes.

3 Principle Combination Strategies

Evidence clearly correlates the strength of a solution to the number of Inventive Principles that have been used to generate it. Two strategies for using the Principles most effectively in combination with one another are described in our recently launched ‘TRIZmeta’ card game. The main one involves the use of combining solution clues derived from the use of individual Principles.

Getting The Best Out Of The Contradiction Matrix

In light of the publication of the new version of the Business Matrix, it felt like a good time to review different ways of using the various different Contradiction Matrix tools. We’ve had twenty-five years of using the various different evolutions of the Matrix, teaching others, and watching people working on real problems using it. Over that time, we’ve tried or noticed many different strategies and methods. Some work better than others, but when we step back from all of the variants, three strategies stand out as more effective than others:

Route 1: Finding ‘The Right’ Box.

Route 2: ‘All Possible Boxes’.

Route 3: 40 Inventive Principles

Route 1: Finding The Right Box.

This has become my own default method of using the Matrix. Mainly because, I think, the biggest advantage of this route is that it forces the user to spend as long as possible in ‘problem definition’ mode. The trick to getting the most out of using the Matrix this way is to spend time in the specific-to-generic translation:

Figure 28 Route 1 Time Focus

By only allowing yourself the possibility of choosing one improving parameter and only one worsening parameter, it forces you to really think about what precisely you’re trying to improve and what’s on the other side of the conflict.

To take a typical example, many ‘specific’ problems involve cost. But, of course, there is no cost parameter in the (technical version of) Matrix, because, in effect, all 50 of the available parameters in the menu have a relationship with cost. What the list is in effect forcing the problem definer to think about is, ‘precisely what aspect of cost is it that you’re trying to improve?’ Is it material cost, for example (Production Cost). Or is it an inadequate durability cost (Support Cost)? Is it about reliability (Support Capability)? Or is the amount of time more important? By forcing yourself through this kind of thinking process, you’re giving yourself the best shot at ensuring you know exactly what the conflict you’re trying to solve is. And then, by implication, that the Inventive Principles the Matrix presents back to you after you’ve finally allowed to look in the relevant row and column intersection box, are all going to be meaningful and usable.

Route 2: All Possible Boxes.

In many ways the opposite to the Route 1 strategy is the one that allows the user to choose as many of the Matrix parameters they think ‘might be’ relevant to their specific problem as they like. This effectively allows the user to spend a lot less time thinking about what the actual conflict they’re trying to solve is, and to get to the solution generation part of the process as quickly as possible.

If the problem solver is using the paper version of the Matrix, the first downside of this Route 2 strategy is that it can get pretty tedious looking up lots of boxes in the Matrix. What will almost inevitably happen, however, when users do adopt this approach, is that they will quickly begin to notice the same Inventive Principles suggestions appearing in multiple different boxes. This is the ‘self-correcting’ nature of the Matrix coming to the fore. It happens because, turning the story around the other way, whenever the SI research team adds a new case study onto the Matrix, the strategy they use says, if we don’t know which specific box to put a given solution into, we’ll put the solution into multiple boxes.

If you’re using the software version of the Matrix, of course, all of this ‘self-correction’ ranking of the Inventive Principle suggestions is done for you:

Figure 29 Route 2, ‘All Possible Boxes’ Matrix Strategy

The main downside of the Route 2 strategy is still to come, however, irrespective of whether you’ve been through the manual or automated Principle ranking task. And that is that some of the Principle suggestions will be quite difficult to connect to the problem you’re trying to tackle. In no small part this problem arises because you haven’t actually spent the time to really think about what your problem is. I’ve seen many occasions where teams have travelled this route, encountered a Principle suggestion that they have no idea how to connect to what they think their problem is, and have thus ignored it and moved on to the next Principle on the list. Whereas a later search of a knowledge database has revealed that many others have indeed used said Principle to derive a very elegant solution to what you eventually realise was your problem.

Route 3: 40 Inventive Principles

This is the route favoured by the Matrix-averse. On one level, their rationale is very logical: ‘if there are only 40 Inventive Principles, and this is a real problem we’re working on, why wouldn’t we examine all 40 of them?’ The most obvious advantage of this route is that it misses the first two steps of the process completely and allows users to get straight to the exciting idea generation part of the process.

The downsides are, unfortunately, somewhat less obvious. As with Route 2, one issue is that the idea generation activity is less focused because no-one in the session has really had an opportunity to really think about what the problem being solved actually is. The more insidious disadvantage is that brainstorming through 40 Principles and doing it effectively is hard work. Or rather, ‘it should be’. Something I notice a lot with teams that track down Route 3 is a propensity to goof off when it comes to doing the hard work. I’ll hear comments like, ‘we already had that Principle’ when they see that one Principle appears similar to another (e.g. Principles 3 and 4 have a very clear overlap). A truly disciplined use of the 40 Principles would involve doing the opposite of trying to find excuses to not use a Principle – the key to successful use is looking for the parts of each Principle that don’t overlap with other ones. That’s a fairly counter-intuitive and therefore difficult mindset for people to get themselves into.

Which Route?

The existence of these three different Routes is perhaps indicative of a higher level contradiction. Should I use Route 1 or route 2 or 3 is ultimately the wrong question. We know it’s the wrong question because it has the word ‘or’ in it. If we were actually using the philosophy of the Contradiction tool, we’d do something to solve the contradiction. Which, in practical terms means knowing where, when and under what conditions the various options needs to be separated.

That story, we believe, looks something like this:

Route 1 The ‘Right Box’:

- Advantages: Forces rigorous problem definition; best opportunity that the Inventive Principle suggestions will connect to the problem at hand

- Disadvantages: Difficult to get teams to want to devote sufficient time and effort to the ‘boring’ problem definition task; takes the ‘fun’ out of idea generation.

- Where/When To Use: Use Route 1 before a brainstorming session rather than ‘live’ within the session.

Route 2 All Possible Boxes

- Advantages: Very rapid transition between problem definition and solution generation; self-correcting nature of the Matrix will become apparent – helps to build confidence in the credibility of the tool.

- Disadvantages: Lack of focus on the ‘actual’ problem often means that the Inventive Principles suggested ‘don’t make sense’ and get ignored

- Where/When To Use: Novice users of the Matrix; workshop setting where it is helpful to demonstrate and work through the ‘whole’ contradiction solving process

Route 3: 40 Inventive Principles

- Advantages: Eliminates most of the process; potential to be highly comprehensive in idea generation terms.

- Disadvantages: Too easy to ‘goof-off’ and not do the Principles justice; requires considerable persistence to do properly

- Where/When To Use: ‘Quick & dirty’ problem solving sessions; deep problems where there is time to conduct the ideation in several sessions rather than all in one session

Complex Systems & Root Contradictions

“If a factory is torn down, but the rationality which produced it is left standing, then that rationality will simply produce another factory. If a revolution destroys a government, but the systematic patterns of thought that produced that government are left intact, then those patterns will repeat themselves… there’s so much talk about the system. And so little understanding.”

Robert Pirsig, Zen & The Art Of Motorcycle Maintenance

“Some problems are so complex that you have to be highly intelligent and well-informed just to be undecided about them.”

Laurence J Peter

A Crash Course In Complex Systems

Figure 30 Complex Systems In Action: A Murmuration Of Starlings

One of my favourite experiences in the whole world is watching a murmuration of starlings (Figure 30). Half a million small birds flying in spectacular close formation before they roost for the night, creating an ever changing pattern in the sky. Not only is it beautiful to watch, it’s also a terrific example of a complex system in action. No-one (including the starlings themselves) can predict what the shape of the murmuration will look from one moment to the next. The overall shape of the murmuration is what complexity scientists would describe as ‘emergent’.

Emergence is a key property of any complex system. Here’s a list of some of the other important characteristics of complex adaptive systems, as may be relevant to the context of problem solving and innovation :

3.1 There is no definitive formulation of ‘the problem’… you don’t understand it till you solve it

3.2 There is no end to the problem

3.3 Solutions are not true-or-false, but merely ‘good’-or-‘bad’

3.4 There is no immediate and no ultimate test of a solution to the problem. Every instant of the problem is essentially unique (‘you can never step in the same river twice’)

3.5 Every solution to the problem is a ‘one-shot operation’; because there is no opportunity to learn by trial-and-error, every attempt counts significantly

3.6 There is not an enumerable set of potential solutions, nor is there a well-described set of permissible operations that may be incorporated into a plan

3.7 The problem is a symptom of another problem.

3.8 The existence of discrepancies when representing the problem can be explained in numerous ways – there is no such thing as ‘the root cause’

3.9 Small discrepancies in understanding or modelling of the system can quickly get magnified into extreme differences in outcome (the apochrypal butterfly flapping it’s wings and causing a hurricane, and pretty much any attempt to predict weather)

3.10 The choice of explanation determines the nature of the problem’s resolution

3.11 Every complex system ‘emerges’ from the interaction of one or more basic underlying principles (‘levers of influence’/’DNA’). The more complex the problem, the more hierarchical levels of these underlying principles there are likely to be.

3.12 The quality of the solution is determined by the proportion of ‘all’ the underlying principles that are understood and have been incorporated into the solution model (‘Only variety can absorb variety’)

3.13 The connections between the things in the system are more important than the things.

3.14 The ‘best’ way to solve a complex problem is to make modification at the principle level.

In the case of the starling murmuration the underlying principles from which the overall shape and pattern emerges is quite simple. There is no controlling starling with a master plan, there is simply a heuristic ‘fly as close to your neighbours as possible’ being enacted by each and every starling. Watch a murmuration for a while and you notice that there are never any impacts. Try and focus on one single starling and you’ll start to see how it applies the simple ‘stay as close as possible’ ‘rule’ and how tiny variations in their distance serves to trigger enormous changes in the shape of the overall murmuration.

If murmurating starlings illustrate emergence in action from a relatively simple heuristic, mathematician Benoit Mandelbrot went a whole world further when he first published pictures of what we now know as the Mandelbrot Set. Amazing levels of complexity all arising from some apparently benign and extremely simple mathematics – f(z) = Z2 + C. How could it possibly be that such simplicity could produce such hypnotic beauty?

Figure 31 Mandelbrot Set

The Mandelbrot Set kind of looks like nature, but actual nature is where we need to head in order to find the most amazing illustrations of emergent behaviour. One of the most remarkable nature-made structures is the termite mound. Amazing structures, sometimes several metres high, built by hundreds of thousands of termites, with, again, no master plan.

Figure 32 Termite Mounds - Australia

Termites are small and their brains even smaller, so the instructions they are able to follow are relatively simple. Not quite so simple as ‘fly as close to your neighbour as possible’, but not by much. Termite mounds emerge from a set of ‘rules’ that look something like this:

If Queen pheromone level exceeds threshold, go collect material

Walk around randomly; if you find useful material pick it up; if you find other useful material, put what you have down.

If temperature or oxygen level inside the mound drops below a comfortable level, block exit and entrance holes; if temperature or oxygen level exceeds a comfortable level, clear the exits and entrances.

If unexpected holes appear; fill them And that’s pretty much it.

Every termite mound emerges to be completely unique, but at the same time, they’re all pretty much the same. And they will be continue to be so as long as termites keep applying the same basic principles.

If we wished to encourage termites to make a ‘better’ mound, the way to do it would be to change those principles. Any other means of altering the design of a mound wouldn’t work

– the termites would simply keep applying their already established rules and the mound as we know it today would consistently ‘re-emerge’. Take a chainsaw and lop the top off a mound, and within a very short while it will magically re-appear.

The ultimate point here is that whenever we (humans) attempt to change a complex system by any other means that changes to the underlying ‘’DNA’ principles, the system will always naturally return to its original state. We see this in action with the large majority of change initiatives inside organisations: a wilful manager decides they want to (say) create an ‘innovation culture’ across the business and then try and bludgeon everyone into complying with their desire. If they’re lucky, they might get some actual useful innovative output for a while, but if they haven’t understood or made the change happen at the ‘DNA’ level, very soon after they depart for pastures new, the system will revert to its previous un-innovative state.

Even when we try and change a system at the principle level, in the majority of cases, we end up with a mutated system that is worse than it was before. We can observe a very simple example of a ‘principle-level’ change in a starling murmuration if a hungry falcon happens to turn up. Add a falcon to the murmuration and the ‘fly as close to your neighbour as possible’ heuristic very quickly gets replaced by another rule: ‘get away from the falcon’. Add the falcon to the system and the beautiful display of mass aerobatics quickly turns into a chaotic mess of starlings flying into one another.

Figure 33 Tipping The Complex System Into Chaos – Arrival Of Bird Of Prey

A big part of the SI research is trying to get to an understanding of how complex systems – like ‘society’ – work at this ‘principle’ level. TrenDNA, for example, has DNA in its title because our aim was to uncover the underlying principles that influence and drive why systems emerge in the way they do. The Strauss and Howe ‘generation cycle’ theory and the underpinning ‘DNA’ idea that society emerges from the way in which parents raise their children and how, for each generation, the choices a parent makes are in turn influenced by how they were raised by their parents. There is no absolute rule that says society has to go through a crisis period every four generations, but merely that, so long as this parental influence ‘DNA’ remains present in the way it is, it’s very likely we’ll keeping seeing the same four generation archetype picture emerging and re-emerging.

Trying to innovate in this kind of complex environment, we propose, fundamentally means altering the system at this principle level, and, moreover, doing it in such a way that, unlike what happens when we add a falcon to a murmuration, we find a change or combination of changes that somehow cause the system to emerge in a manner that is fundamentally better. There’s no rule that says society ‘has to’ enter a crisis period every four generations, but we’ll only ever successfully avoid periodic crises if we manage to somehow alter the parent-child influence model in some way. And, moreover, to do it in such a manner that we avoid the human equivalent of falconry.

We might go so far as to say that innovation only really has the chance to happen when we are able to make changes at the core ‘first principle’ level. Put another way, if we don’t understand what the principles from which our current system has emerged, our chances of innovation success are diminishingly small. Which means, we think, that the key question for any prospective innovation team, when they’re thinking about ‘what don’t we know yet?’ is how well we do or don’t know what the underlying principles – the f(z) = Z2 + C – of our system are.

Spend a few moments thinking about whether you think you might know what the underlying first principles are for a system you’re currently responsible for improving, and we suspect you’ll quickly begin to see why such a large proportion of innovation attempts end in failure.

It’s not supposed to be a scary thought, but it probably is anyway. Call that an underlying principle.

And here’s another one, lest you be wondering whether this complexity stuff has any relevance to you and your work at all. There are a number of ways of establishing whether a system has veered into ‘complex’ territory, some of them involving some quite sophisticated mathematics. When we’re thinking about business systems, fortunately, we can avoid the necessity for such sophistication by bearing in mind the following heuristic: ‘if the system involves two or more humans, it is complex’.

First Principles.

There’s an oft used aphorism, usually attributed to American satirist, H.L. Mencken, which goes, ‘for every complex problem there is an answer that is clear, simple and wrong.’ Like a lot of aphorisms it focuses more on flowing wordplay than absolute truth. Here’s how we think it might be re-phrased to better reflect the realities of actual complex systems: ‘For every complex problem there are thousands of clear, simple, wrong answers. For every complex problem there is a clear, simple, right one. If we understand and affect the first principles’.

Perhaps one of the best things about ‘first principles’ is that, by definition, there aren’t that many of them. They say that the sum total of mankind’s knowledge is doubling in less than a year these days. That’s a scary thought for some. Mainly educators, who we hear routinely saying that its no longer possible to fit everything into the curriculum anymore. Somewhat tragically, one of the early things to have been squeezed out of the curriculum to make room for all this new knowledge has been teaching things from a first principles level. There’s a cruel irony in this omission: if we look at the world from this first principles level, we quickly come to realise that an awfully large percentage of the so-called ‘new knowledge’ is the exact same as the old knowledge. It is, in other words, ‘noise’. Teachers and lecturers, it now seems, spend their time teaching students noise. This has been going on for two generations now. Meaning that, unless something is done about it, society will quickly find itself in the situation where the teachers themselves will never have been taught the importance of understanding how the world works from the first principles level. That’s probably called ‘the blind leading the blind’.

Although the original Soviet TRIZ researchers never (as far as I know) thought about what they were doing in terms of ‘first principles’ research, the reality is that that is precisely what they were revealing. The 40 Inventive Principles being an absolute case in point. Our evolution beyond the initial research means we’ve now been able to analyse nine million pieces of ‘new knowledge’ (e.g. patents and management texts), only to find that there are still only forty effective ways to resolve a conflict.

One way of thinking about the TRIZ bigger picture, and especially it’s ‘systematic innovation’ successors is that they’ve come to represent a global compendium of first principles. We maintain our research team because we know that the job of unearthing the ‘DNA’ of how things work is not yet complete. But we also know that the return on time invested is diminishingly small. Internet content might indeed be doubling every few weeks or months, but our collective ‘first principles level’ wisdom advances at a much more manageable, can we say, glacial pace.

Solving a conflict problem well will inevitably mean that we’ve made use of at least one, and probably a combination of several Inventive Problems. But, just because we’ve used the Principles doesn’t necessarily mean we have tackled and affected the conflict at the first principle level.

In turn, where this starts involves us making a distinction between right-versus-wrong and right-versus-right situations. Contradictions can appear if two people have a different opinion about a situation, one of which is a difference built on the fact that one of the two is wrong, and the other – more interesting – where both are right. This right-versus-right situation (‘you want equality, I want equity’, for example) offers up the biggest opportunity for ‘first principle’ breakthrough if we’re able to somehow break the contradiction. Right- versus-right situations are important enough, we first surmised in Reference 29, to benefit from a more granular definition.

One distinction which seems to be useful is that between the tangible and the intangible (i.e. emotional). Useful in the sense that it’s highly plausible that a person can be scientifically right about a situation and simultaneously be wrong emotionally (think Richard Dawkins). Figure 33 is an attempt to describe the four scenarios that emerge when we split the tangible and intangible, right and wrong:

Figure 34 A Tangible/Emotional Right/Wrong Domain Map

Both dimensions are probably best thought of as a continuum. There are degrees of ‘right’ness in the same way that there are degrees of ‘wrong’ness relating to a situation. In a scientific sense, we often hear the aphorism, ‘all theories are wrong, but some are useful’. In the emotional domain, the distinction between right and wrong is likely even more nebulous. In which case the border between ‘right’ and ‘wrong’ drawn onto the figure is perhaps more theoretical than practical. Although, that said, the boundary between the two is often a matter of degree rather than an absolute. Most people, for example, would agree that democracy is ‘better’ than dictatorship as a form of government, but almost everyone has a different position along a left/right political spectrum that they would vote for as the ‘right’ form of democracy.

Fortunately, the degree of rightness is not nearly so important an issue as that of identifying and solving contradictions. Arguing about Democrat or Republican is ultimately a futile exercise. Treating the Democrat-Republican difference as a contradiction to be solved would be a much more fruitful use of all of our – and our elected politicians’ – time.

The Figure 33 domain map, then, offers up a way to help examine different types of contradiction. If we can imagine placing two individuals’ points of view ‘A’ and ‘B’ about a situation somewhere on the map it ought to be possible to imagine stronger contradiction solution strategies. That topic is the primary focus of Reference 29. As far as our ‘affecting the system at the first principle level’ requirement is concerned, the only combination that need interest us here is the one where both person A and person B are in the top-right hand quadrant of the figure.

The only thing we need to add to that requirement, then, is to ensure we’re operating at the first principle level. From the ‘tangible’ perspective, this means focusing on the outcomes the two parties are looking to achieve. And from the intangible perspective it largely distils down to the ABC-M model described earlier. If a desired increase in, say, your Competence, adversely affects my Autonomy, then there’s the first-principle conflict that needs to be addressed.

Finally, if we’ve managed to intrigue you into the wider world of ‘first principles’, we’ve made a first attempt to compile ‘all’ of them in Reference 30. One day, it feels like that first attempt might turn into another book…

Divergence-Convergence Cycles

The second significant implication of the complex adaptive system traits of effectively all business situations is the preclusion of ‘efficient’ solutions. Efficiency has long been a goal of problem solvers. We can observe the greatest level of success in this direction in the world of operational excellence. This is the world where high efficiency pays the greatest dividends. Any time lost to investigation of problems and to their solution is time that ought to have been devoted to creating more output, and so problem solvers working in this domain have gone to extraordinary mathematical lengths (e.g. Taguchi Methods) to strip ‘waste’ out of the process. We can see similar attempts, albeit not so successfully deployed, from within the technical TRIZ world, and particularly with methods like ARIZ. Success in the TRIZ world has been lower, one suspects, because when we find ourselves working on ‘wicked problems’ of any type, chances are we’re in the world of complex adaptive systems. It is difficult to be ‘efficient’ in this world because, as described earlier, there is no such thing as a ‘root cause’, and because there’s no such thing either as the ‘silver bullet’ solution. Revealing problems and their solutions in the complex world is much more like the job of a murder-mystery novel detective. A world in which our job is to uncover a critical mass of clues such that we are able to piece together a coherent explanation of who committed the murder. Clue-finding is all about exploration and lateral jumps, it’s about heading down dead-ends that you don’t know are dead until you get to the end, and false trails that you can’t know are false until potentially several weeks or months later.

Edward DeBono was the first person to teach us about the importance of ‘designing’ our way through complex situations and the consequent need for ‘exploration’. He is to all intents and purposes the founder of divergent and convergent thinking. And because he’s also the de facto father of Design Thinking, that means divergent-convergent thinking is also central to the underpinning ‘methodology’ it is today built around.

In De Bono’s terms, divergence is all about broadening our array of alternatives, and convergence is all about consolidation and deciding from the revealed alternatives. In any complex problem situation there needs to be a minimum of two divergent-convergent cycles: the first concerned with doing the best job we can to explore options and find the ‘right’ problem, and the second to do the best job we can to explore potential solutions and to determine the most appropriate one(s) for us to pursue. Figure 34 summarises the two ‘double-diamond’ divergent-convergent cycles:

Problem Definition -> Solution Generation

‘Situations’ -> The ‘Right’ Situation -> Solutions -> The ‘Best’ Solution

Figure 35 ‘Double-Diamond’ Divergent-Convergent Complex Problem Protocol

In reality, there may well be many more than two of these divergent-convergent cycles, but fortunately, if there are more, they will essentially be a repeat of the two cycles shown in the Figure. In effect, the double-diamond wraps around on itself, such that, having found the ‘best’ solution, we may choose to take it back around to the beginning of the problem definition divergent phase again, to explore what the potential problems with this solution might be.

When Operational Excellence people tend to describe designers as ‘procrastinators’ for their seeming inability to make decisions, they might offer a hint why we’re mentioning this divergence-convergence characteristic at all: good designers know that, in a complex environment, one more iteration is rarely going to do harm, and will most likely pay dividends in reduction of wasted effort later on (see the ‘designer casts the biggest shadow case study at the end of the previous section of the book). Not only will designers willingly go around the loop again, they have also trained themselves to also do the divergent parts of the process to an extreme level. Usually one that, again, can easily frustrate the will to live from Operational Excellence people. To them ‘exploration’ is strongly equated to waste. ‘Why spend all that time generating hundreds of solutions,’ we will often hear them say in an ideation session built around some of the Inventive Principles, ‘when you’re eventually just going to use one or two?’ In Operational Excellence world, the question makes a lot of sense. In the world of complex problems it makes no sense at all. But the world of business is at a point in its evolution where more ‘successful’ managers and leaders have been successful by being operationally excellent and not by thriving in complex environments. This section is ultimately here as a warning to business conflict solvers: people who will very likely still be in the early stages of problem exploration, when everyone else in their problem solving session is already pulling their hair out because the problem ‘isn’t solved yet’. Call that a conflict begging to be solved on a whole other level (although the Business Matrix will – of course – provide guidance!). One solution – if we’ve done our job well – is to obscure ‘the waste’ in an efficient-yet-complexity-embracing process called COBRA+. Another is to hope that awareness of the problem is more than halfway to providing the solution: Exploration isn’t waste it’s your future success. Iteration isn’t waste either, it’s the thing that will stop you wasting hundreds of thousands testing ‘solutions’ that another thirty minutes of patient iteration would have told you weren’t nearly good enough yet.

COBRA+ Process

As we’ve effectively now heard, every business problem is inherently complex. And inherently needs to address intangible ‘emotion’ issues. Solving complex problems necessitates getting the problem back to a first principles level. The overall Systematic Innovation and TrenDNA processes are intended to help problem solvers do exactly that. The downside of both processes is they demand a certain learning overhead. An overhead that circumstances may mean is unacceptable. The COBRA+ process is intended to fill the gap. It too ensures problem solvers tackle the issues they’re trying to address back to the first principles level. Figure 36 describes the basic steps of the process:

Figure 36 COBRA+ Overall Process

The process is also template-based in order to best enable problem solvers to work through a logical complexity-embracing sequence of steps. The overall process forms a cycle, and as such, allows a problem solver to undertake as many iterations as might be necessary to achieve an ‘appropriate’ solution. The test for what might be classed as ‘appropriate’ is contained within the process.

A first iteration around the COBRA+ cycle typically begins with C for Compass.

Compass is all about making sure we know where we’re heading. Irrespective of where we think we should be heading, TRIZ tells us that all successful solutions head towards an ‘Ideal’ end state in which all the intended stakeholders receive all the outcomes they’re looking to achieve with no negative consequences. Put into lay-person terms, every system evolves to a ‘free, perfect and now’ evolutionary end point. As may be expected, this end point is more theoretical than practical. From a practical perspective it will typically entail solutions that deliver useful functions ‘by themselves’: the ideal software updates itself; the ideal team manages itself; the ideal advertisement targets itself, and so on. The usual manner of interpreting the Compass part of COBRA+ is to encourage problem solvers to think about the ultimate ‘ideal’ solution, and then the pragmatic ‘ideal’ we wish to achieve in the current scenario.

Next up comes O. O is for Outcomes. As discussed earlier in the book, when we’re discussing situations involving humans and we’re thinking about ‘outcomes’, we need to consider both tangible and intangible sides of the story. If we’re smart we should also think about what each of the different stakeholders present within a situation are looking to achieve, and what the people around those stakeholders are trying to achieve. Then, as if we’re not already making life difficult for ourselves as problem solvers, we also need to consider how those outcome needs alter at different stages of the story. The FMCG sector spends a lot of time thinking about ‘Moments of Truth’, critical moments when, in their case, consumers make decisions about the products being sold to them. In their world, there are basically two Moments of Truth – number one, did the consumer select their product off the supermarket shelf, and number two, when they got the product home and used it, did it work? In other industries, the number and type of Moments of Truth is likely to be rather more complex. The COBRA+ outcome-mapping job, if we’re to do it right, requires us to identify the tangible and intangible outcome needs of each of the stakeholders at each of the Moments of Truth. Taken to the first principles level, the job is easy, and we simply fill out this template:

Figure 37 Outcome Map

The time-consuming part is creating one of this tables for each stakeholder at each Moment of Truth. So that we end up with something like the image shown in Figure 37.

Next up comes B for ‘But’. Here’s the part of the process where we deliberately force ourselves to run towards the things that will prevent us from achieving all the things we’ve identified we wish to achieve in the previous C and O stages of the process. ‘But’ is a short- cut for ‘yes, But’. Or we could call it ‘Barriers’. It’s about identifying all of the things that we perceive might prevent us from achieving a successful solution. Here’s the first part of the COBRA+ process where we explicitly start to think about complexity and complex adaptive systems. Normally (i.e. if we hadn’t accepted our business challenge was a complex one) we would be encouraged to go and find the ‘root cause’ of our problem. Once we accept that a situation is complex, we have to accept that there is no such thing as a root-cause. The links between cause and effect in a complex system are often remote and inter- connected. The strong likelihood is that the outcomes our system currently delivers are emergent and that what they emerge from is a ‘conspiracy of causes’.

Figure 38 Overall Outcome Landscape

Once we’ve identified all of the ‘yes, but’s’ preventing us from achieving the outcomes we want (versus the ones we might currently be getting), the heart of the ‘B’ stage of COBRA+ involves us mapping the relationships between each of the ‘yes, but’ statements we’ve been able to identify. Here’s another important feature of complex systems: it’s not so much the things that determine the behaviour of the system as it is the relationships between the things. The way the process works here is we map the ‘betweens’ by asking the question ‘which of the other ‘yes, but’ perception statements does this one lead to?’ We need to answer this question for each of the ‘yes, but’ perceptions we’ve been able to list. Then we can draw a map of what we’ve done. The map should end up looking something like this:

Figure 39 Typical Perception Map

..which can appear a little intimidating at first (although this particular map is for a somewhat more complex problem than most). What will inevitably appear, however, is at least one loop. And because the map has been constructed based on a list of ‘yes, but’ statements, those loops (actually only one in this example – in other situations, there may be more) will define the vicious cycle (or cycles) that are preventing us from achieving our desired outcomes. At this point we have found something important: the critical part of the ‘conspiracy of causes’ that will prevent us from getting to where we need to be. Actually, we’ve also identified something else that may turn out to be important. Looking at the above map, notice the box ‘Q’ which has multiple arrows pointing to it. This is what we call a ‘Collector’. It is one of the important things ‘driving’ the vicious cycle. If we combine the idea of loops and collectors, we can also notice that the boxes labelled ‘simple truths beat complex lies’, ‘Brexiteers more passionate’ and ‘Big Beasts’ are not only in the vicious cycle loop, but they’re also Collectors. This is trying to tell us that, as we transition from problem definition to solution generation, these are the most important areas for us to focus our attention on. In a complex situation, everything is, of course, connected to everything else, but nevertheless, when we’re looking to change the system (hopefully for the better), we need to start somewhere. This ‘yes, but’ map is designed to navigate us to those places.

We still haven’t solved anything at this stage in the process, but we do now know what the important problems are, so we can begin the transition to solution. This brings us to the R part of COBRA+. R stands for Resources. The job in this part of the process, then, is to make a search for anything (knowledge, things, processes, people, measures, etc) that is either in or around our current system that we might be able to bring to bear to help us to improve the system. In theory, this is the simplest part of the process. In practice it can often require us to do some deep thinking about what we already have that we might not recognise we have. The best heuristic to keep in mind when making this search for Resources is that any time we allow ourselves to add something new to a system, we’ve just made it worse. In that we’ve taken it further away from the ‘Ideal’ we identified in the C- stage of COBRA+. Here’s another heuristic: 99 times out of a hundred, the resources needed to solve the problem are already there in or around our system, they just haven’t been recognised as resources. Or – important point – they have been things that we’ve viewed as harmful things rather than things that will help us to get to where we want to be. Lack of money, competitors and the person that arrives at meetings apparently intent on disrupting everyone are all things that are easily classifiable as negative things, but as far as our search for Resources is concerned, they’re also likely to be some of the best opportunities we will have to solve our problem.

Now we arrive at A for ‘And’. This is the part of COBRA+ where we do all of the heavy-lifting in terms of solution generation. There are numerous way to do this idea generation job. The simplest, now the C, O and, particularly, B stages have told us where we’re trying to get to and what’s stopping us, is to simply brainstorm solution ideas. The next simplest is to look to the world of TRIZ and this book and make use of the 40 Inventive Principles. The most effective way is to make use of the Business Matrix that makes up the heart of this book. It’s job is to identify the most likely of those 40 Principles for our particular situation. The ‘And’ process, therefore, makes use of the Conflict Abstraction Template (CAT) shown earlier in Figure 11. The way we start the job of using this template is to equate the ‘thing we’re trying to improve’ box at the top left of the picture to our Compass ‘ideally’ statement. And the thing stopping us are the most important of the ‘yes, but’ perceptions as defined by the ‘yes, but’ map from the ‘B’ stage of the process. Once we’ve translated this ‘specific problem’ into the generic improving and worsening parameters offered down the sides and across the top of the Matrix, we can start looking up the relevant Inventive Principles at the intersections between the relevant rows and columns. Then, when we have these Principles, we can begin generating a list of ‘And’ solution clues. In true TRIZ (and Design Thinking ‘divergence’) fashion, our target here is to generate as many solution clues as possible. The SI team in-house heuristic is ‘diverge until it hurts’. As a minimum, we force ourselves to generate at least five clues from each of the offered Inventive Principles. If we’re feeling particularly motivated, the five will become ten. Or twenty. There’s rarely a downside to generating ‘too many’ ideas. Forcing ourselves to generate lots of ideas forces us to put aside consideration of the quality of those ideas and to get ‘out of the box’ and start thinking about more radical solution directions. The ultimate idea being that, once we start the process of converging on the solutions we might actually consider taking forwards, we will be looking at combinations of the solution clues we’ve generated. A radical clue on its own is rarely going to give us a ‘silver bullet’ solution, but a radical clue in combination with some of the other clues, is very likely to give us the breakthrough we’re looking for. The ‘And’ process is largely a divergent one, but after we’ve ‘diverged ‘til it did indeed hurt’, there’s a need to start doing the convergent job of identifying the solution clues (and combinations thereof) that will give us a first insight into how we’re going to solve our problem.

This, finally, takes us to the ‘+’ stage of COBRA+. This is the place we close the loop back to the initial Compass heading we defined. It is all about examining the appropriateness of the insights and solutions that have emerged from the ‘And’ solution generation stage. ‘+’ is all about the comparison of where we trying to get to versus where our new solution has got us. It’s the place where we decide whether we need to go through the whole COBRA process another time, or whether the solutions we have are ‘good enough’. There are a number of criteria that ‘+’ expects problem solvers to examine in order to make the decision about whether we’re finished or whether we need to do more work. The typical ‘+’ questions are:

Is the solution good enough? Do all the stakeholders perceive a win?

Do we possess a critical mass of resources to successfully execute the solution?

Do we possess the requisite level of capability to successfully execute the solution? Do we possess the requisite will, stamina and persistence?

Figure 40 Typical ‘+’ Stage Loop-Closing Questions

If the answer to any of them is ‘no’, then we really ought to go back to ‘C’ and conduct another iteration, either refining our initial Compass heading, or re-defining the problem in terms of where we are experiencing our ‘no’. A likely scenario for example, is that we enter the ‘+’ stage of the process with a solution that we think is the best thing we’ve ever dreamed up in our lives, but, unfortunately, when we are forced to think about the question, ‘do we possess a critical mass of resources to successfully execute the solution?’ we realise we do not. Now the new problem is either a new Compass heading that focuses on how we might acquire that critical mass of resources, or how we rethink our beautiful solution such that it is achievable with our existing resources.

If we’re operating in true Design Thinking mode, there is no limit to how many times we might find ourselves looping around this COBRA+ process. In reality, what we’re doing is very brain-intensive and therefore energy-sapping. The heuristic in the SI team when we’re working on real problems is ‘go around the loop once and get a ‘good’ solution; force yourself to go around a second time and you get a ‘great’ solution’. Ultimately, it all depends on how much time and energy you have, recognising too, that in a complex environment, you can’t ‘know’ what the right solution is until you’ve tested it with your full spectrum of stakeholders. And, again in Design-Thinking and ‘minimum viable demonstration’ modes, you’re looking to do that as soon as you possibly can. I.e. the stakeholders are the ultimate arbiters of the first ‘+’ question of ‘is the solution good enough?’ and they can only meaningfully answer that question when we’ve given them something to play with.

COBRA+ Case Study

As with many things in life, it is often easier to grasp a process by seeing a tangible example rather than by reading abstract theory. This in turn offers up a new problem: how to describe a meaningful business case study without devoting multiple pages to describing the context? Well, one way is to reference a case study so that anyone desperately interested in the specifics of the case rather than how the COBRA+ process might help us to bring clarity and insight. Reference 31 does that job. For everyone else, the bare minimum context information follows:

The problem involves a specific exemplar of a generic problem: how to introduce the right measures and incentives into a system in order to deliver the right outcomes. The specifics of the situation in this case involve the higher education sector, where, following the introduction of a series of incentives a few years ago, it has rapidly become apparent that the intended outcomes and the actual outcomes were wildly different. The difference reveals another generically applicable finding: when people are subjected to dumb measures, they start treating them as targets, and the system becomes corrupted. People stop being honest actors and start playing games to ensure they personally ‘win’. The overall intent of the original incentives was to increase ‘true scientific productivity’ – i.e. to encourage academics to do more effective research more efficiently. The following table, extracted directly from the Reference 31 paper, illustrates the incentives, the intended effects and the actual outcomes.

Table 2: Growing Perverse Incentives In Academia

With this initial situation as the focus, we can begin to explore the use of COBRA+ as a means of moving the current dysfunctional, corrupted state into – hopefully – a better one. The first stage of the process is C for Compass. This stage is all about making sure we know where we’re heading. The template sheet asks problem solvers to define a long term and a nearer term ‘pragmatic’ Ideal end goal. Here is an example of what the completed template might look like in this situation:

Figure 41 Completed Compass Template For Exemplar Case Study

For the ultimate Ideal end state, it is always useful to think about and try to incorporate the word ‘self’ into the definition. In this case, we could have stated that the Ideal was that the research ‘conducted itself’, which might be a possible goal, albeit one that would appear on the face of it to be quite threatening to the academic world. It would nevertheless have been a legitimate statement to make since, at some point in the long term AI-filled future, the research inevitably will be done ‘by itself’. But in this instance, because the focus is on the system of incentives, the decision was made to define the end state as ‘self-organising’. Both definitions would have been valid and it is up to the problem solver or problem-solving team to decide what their level of ambition is.

In either event, the template also asks us to define the nearer-term more pragmatic Ideal. This is the one that will in effect be used as the end goal defining where we’d like to reach at the end of this current problem solving cycle. It could, of course, be the same definition as the ultimate Ideal, but in this particular case, the decision has been made to focus on the achievement of what is in effect a resolution of the effective-versus-efficient conflict and to create a research system that does what society needs it to do. Again, the choice of Compass heading is determined by the ambition level of the team. It’s important to get this definition right, and it’s good to spend time thinking hard about it during this first iteration of the COBRA+ cycle, but at the same time, we also know that we will have an opportunity to re-think it when we come to the end of the first cycle and are contemplating starting a second. If in doubt, get started and let the process guide you.

Meanwhile, having completed the C template, we’re at liberty to proceed to the next stage of our first cycle through the process. This is where we get to think about the O for Outcomes the various different stakeholders are looking to achieve at each of the Moments of Truth that might be relevant to us. The first task here, therefore is to define who those stakeholders are, and what Moments of Truth they are likely to encounter. Here’s what this particular team decided to include:

Figure 42 : Completed Outcome Scoping Template For Exemplar Case Study

Having defined these two inputs, we’re now potentially faced with the prospect of constructing a 2x2 Outcome Map for each stakeholder at each of the various Moments Of Truth. This is potentially quite a lot of work. It is also important that we do it since what we do here is going to have a big influence on our eventual likelihood of success. If any one of the stakeholders is not getting what they perceive they are looking for at any Moment of Truth they can easily cause the whole system to revert to its current – or worse – state.

That said, as far as writing up the case study is concerned for the purposes of this book, printing 30 (6x5) completed 2x2 matrices is going to take up a lot of pages and not add a lot of value in terms of communicating the important learning points. With that in mind, we will print two of the completed templates in order to communicate what needs to be communicated. We start with the researcher at the moment where they’re submitting the paper describing the findings of their research:

Figure 43 Completed Outcome Map Template For ‘Researchers’ In Exemplar Case Study

Important to note when we are completing these template sheets is that we think about the outcomes the stakeholders are looking to achieve in the future as well as looking at what they’re achieving in the current situation. Some of these things will be positive and some will be negative. Any time we find a situation in which the current outcome is a negative one, we have obtained a potentially important clue about what we might look to improve in the eventual solution. In this particular template, following the convention of accountants, the outcomes in parentheses are the ones that are currently perceived to be negative. In a problem solving session not confined by the limitations of black-and-white printing, it is probably easier to distinguish between the positive and negative by using different colour pens.

Also important when completing the – usually more difficult – right-hand ‘intangible’ columns is to think about the ABC-M model and how well or otherwise those fundamental needs are or are not being met by the current system. We know inherently that in the future we’re supposing to be designing a solution in which they’re all heading in the direction of ‘getting better’, but first up we need to know where they currently are. Bearing in mind too that we need to think the current state through for ourselves, empathising with the stakeholder, but at the same time recognising that if we go ask them about the intangible stuff, we’re unlikely to come away with any kind of meaningful answer. The other watch-out in some industries is whether to include the ‘M’ for Meaning part of the ABC-M model. Meaning is a fundamental need but forcing people to think about it in many current contexts swiftly serves to force problem solvers to recognise there’s an awful lot of meaningless stuff around us. If you don’t wish to get into those kind of deep waters right now, the suggestion is to note the problem for future consideration, and to focus on getting ABC moving in the right direction for now. Fortunately, in this particular case study, we’re almost inherently in the Meaning- delivery business and so have every desire to include it in the analysis.

Here’s a second version of the completed 2x2 Outcome Matrix, this time completed to examine the perspective of the Reviewer at the Moment of Truth where they’re submitting their review decision.

Figure 44 Completed Outcome Map Template For ‘Reviewers’ In Exemplar Case Study

Finally, really by way of demonstrating that we did actually construct all 30 Outcome Maps, one thing that became apparent was that when we connect the incentives that are in place in the current research system – i.e. the list of incentives from Table 2 – to the ABC-M intangible outcome needs we find a picture that was almost universal across the different stakeholders. Here’s what that picture looks like:

Figure 45 ABC-M Assessment For Incentives In Exemplar Case Study

Here we note that none of the current incentives within the system do a good job as far as getting the ABC-M drivers moving in the right direction. In every case they serve to detract from Meaning, and in two cases in particular – rewarding for increased grant funding and increased US News ranking – all four of the ABC-M metrics are heading in the wrong direction. The ‘O’ stage of COBRA+ is about a divergent problem definition task, so we shouldn’t expect to have ‘solved’ anything at this stage, but as far as identifying opportunities to improve the overall system, there seem to be plenty of opportunity ‘clues’ on show in this picture. We could, should we so wish, jump forward to the ‘And’ stage of the process and explore some potential solutions (knowing that we can always jump back to where we left off if we don’t get good solutions), but, first time through, its highly recommended that we stick to the sequence that COBRA+ lays out for us.

Which means that next up comes B for Buts. This is often the part of the process we hear delegates describing as ‘cathartic’. It’s where we get to list out all of the things that we perceive will prevent us from achieving our pragmatic Ideally statement as defined at the Compass stage. Fortunately, in this case study that work has largely been done for us by the authors of the Reference 31 paper when they laid out all of the ‘Actual Effects’ that have resulted from the system’s current suite of incentives. Each one of these statements can effectively be re-written as a ‘yes, but’ reason why we can’t achieve what we want from the system. Here is that list of Actual Effects in their re-worded ‘yes, but’ form as they would be entered into the template sheet:

Figure 46 Translating Current State Into ‘Yes, But’ Statements In Exemplar Case Study

And then, after we’ve completed the ‘Leads to’ column on the template, we can draw the Perception Map.

The Perception Mapping process and the underlying psychology of the ‘leads to’ question have been described in multiple sources in the Systematic Innovation suite of outputs, but probably easiest in this instance to start with the Hands-On Systematic Innovation for Business & Management chapter (Reference 5, Chapter 9). Out of all the tools we’ve built over the years, this is the one that gets used most frequently. The power comes from the recognition (by design-thinking pioneer, Edward do Bono, initially) that understanding complex systems demands mapping the relationships between the things in the system and that the ‘leads to’ question is a way of doing this that engages the creative, divergent parts of the brain to do the job. What the process here forces us to do is take each of our ‘yes, but’ statements and answer the question, ‘which of the other ones does this statement lead to?’

In each case, when answering the ‘leads to’ question, the process forces the problem solver to choose one other statement. In situations where we can see that one statement leads to potentially multiple of the other ones, we make our choice on the basis of which one it leads to first.

When we’ve completed all of our ‘leads to’ answers, the final job is to construct the Perception Map. Here’s what it looks like in our current case study:

Figure 47 Resulting ‘But’ Stage Perception Map In Exemplar Case Study

And here’s the critical elements of the Map as far as drawing conclusions pertaining to what the main contradictions preventing us from achieving the Ideal solution are concerned:

Figure 48 Vicious Cycle Detail From ‘But’ Stage Perception Map In Exemplar Case Study

What this vicious cycle loop tells us in this situation is that the most significant issue – being both part of the loop and also a collector of multiple other perceptions – is what we might think of as ‘mis-directed thinking’. In other words, because academics are ‘forced’ to play games in the system to meet the incentive targets, they are spending less time on the important research issues. If we are to start somewhere to break out of this vicious cycle, this would be a good place to start.

Having now found a good place to start, we have come to the end of the problem definition convergent stage. We’re now ready to make the transition into solution generation tasks.

The first of these is R for Resources. The main idea behind this stage is to look for things in or around the system that we’re not making best use of. There are several ways to do this job, the most structured of which is to use the 9-Windows tool from TRIZ (Reference 5, Chapter 4). Here’s the results of filling out the basic 9-Windows template for our case study problem:

Figure 49 9-Windows Resource Assessment In Exemplar Case Study

The main thing to bear in mind as we make this resource search is to keep going – we’re in divergent mode and so we’re encouraged to keep on looking even after we might have had an ‘a-ha’ moment or two when we identify things that instinctively feel like they will be ‘the answer’ to our problem. In this case, thinking about emerging AI tools, for example, might immediately suggest an intriguing area for deeper investigation, but that ‘discovery’ hasn’t stopped the search for other potential resources to continue.

Also worth paying attention to is the TRIZ idea that, ‘even the bad stuff is good stuff’. Some of the ‘resources’ identified in the Figure appear at first glance to be problems rather than things that can help solve the problems at hand. Inside each of those negative things lies the potential for significant breakthrough. ‘Lack of money’ is usually viewed (today at least) as a problem, but it is also a potentially terrific resource: lack of money forces researchers to think harder about the problem they’re trying to solve and become more imaginative about how they move the subject forward.

There’s often a temptation to also ‘goof-off’ a bit when using the 9-Windows tool. It’s hard work, and therefore human’s have an innate temptation to stop when we believe we have ‘enough’ clues and ideas. The main difference between innovators and make-believe- innovators is the sometimes extraordinary level of persistence exhibited by the former. The good news, either way around, is that should we find ourselves one a second or subsequent cycle through the overall COBRA+ process, we won’t have to start from scratch every time we reach the R stage. We might have a more focused set of clues to help in the search for additional resources to the ones we revealed in the previous cycle, but we’ll also still have the previous set already laid out in the 9-Windows template.

Next up, then, comes A for ‘And’. This is where we – finally – get to make use of the Business Matrix. We’ve discussed the mechanics of how to map our specific problem onto the generic parameters that are included in the Matrix in an earlier case study example, so all we need to do here is reproduce the And template used to map this case study problem. It looks something like this:

Figure 50 Completed ‘And’ Stage Conflict Mapping Template In Exemplar Case Study.

(We mapped ‘true scientific productivity’ onto the Matrix as ‘Amount of Information’ on the basis that productivity in the research sense is, in our mind, all about the generation of new and useful knowledge. We then interpreted the Perception Map vicious cycle loop as a very emotion-driven propensity on the part of researchers to devote their creative energies to the wrong problems. The best fit for this from the 45 available Matrix Parameters seemed to be the intangible catch-all, ‘Negative Intangibles’.)

Now we have a list of Inventive Principles we can start using to generate as big a list of solution clues as we have the energy to continue with. Within the Systematic Innovation team, we usually force ourselves to generate at least five ‘clues’ from each of the Inventive Principles in our list. Importantly, the primary job at this stage is to focus on quantity. Here’s the result of deploying a ‘minimum of five clues per Principle’ heuristic during the ideation session.

Inventive Principle 2 – Taking Out/Separation.

• Remove all the meaning-detracting incentives

• Remove all incentives

• No merit marks for citing papers that are found to be low quality

• Take-out reviewers (machine reviewing?)

• Separate ‘quality’ from ‘quantity’ (recognise that both are valid at different times in the evolution of a subject area)

Inventive Principle 13 – The Other Way Around

• Transform meaning-detracting incentives into meaning-builders

• Have researchers and reviewers design the incentives

• If popular media likes it, it is ‘lowest common denominator’?

• If paper is rejected, this often means it contains a more radical step-change

• Incentives for debunking bad research (cross-disciplinary)

• Make the problem solvers (research community) solve the problem

Inventive Principle 10 – Preliminary Action

• Survey researchers/managers to establish meaningful measures

• Analyse which papers had genuine impact (not citations) and reverse engineer what defines ‘good’

• (Contradiction-solving is what defines good – build tool to look for contradictions)

• Allow researchers to assess ‘quality’/’merit’ of their papers (in private) before they submit

• Publish list of global unsolved contradictions to incentivise research that does useful work

• Build tool to analyse all previous papers to build a global database of what ‘quality’ actually means…

• …use this database to weight citation indices

• Establish/agree universal purpose of research – what are the high-level goals?

Inventive Principle 39 – Calmed Atmosphere

• Introduce a ‘breathing space’ before introducing new incentive system

• Re-calculate merit of research after a period of time (based on pulse-rate of sector)

• Cheating ‘amnesty’ period

• Remove tension – original paper makes everyone defensive (caught cheating), emphasise that the same phenomenon occurs in all other sectors

• All measures/incentives eventually become ‘gamed’ – communicate this to all players and enlist their help in solving the problem

Inventive Principle 24 – Intermediary

• Appoint third-party impartial arbiter of incentive ‘corruption’

• Incentive ‘gaming’ anonymous whistle- blowing repository

• Industry/’Customers’ assess quality/merit of research

• ‘Out of domain’ reviewers – ‘someone, somewhere already solve your problem, they are in a different domain’

• Need for ‘common enemy’ to unite everyone?

• ‘Canary in the coal-mine’?

• Patent Examiners evaluate research?

Inventive Principle 35 – Parameter Change

• Virtual assessment system

• Measure ‘quality’ of papers/research

• Measure contradictions found/solved

• Measure identification of new trend patterns, inventive principles, outcomes

• Measure identification of new or deeper understanding of ‘first principles’

• Measure identification or mapping of ‘unknown unknowns’

• Measure ‘meaning’ and design incentives around that

• Measure cross-disciplinary silo- breakdown research and incentivise that

Figure 51 List Of Solution Clues Generated During ‘And’ Stage In Exemplar Case Study

Notice in this example, how we have also gone back to our Outcome and Resources outputs to help us to turn the abstract Principle directions into clues that are more tangible and relevant to the problem at hand.

Generating large numbers of ideas is taxing work, and so its often a good idea to do the job in several stages. What seems to be especially beneficial is allowing some incubation time. Starting an ‘And’ session in the last hour of a working day, then coming back to continue the job first thing next morning is a perfect way to allow our brain to incubate on connections we failed to make during the first session.

When we’ve ‘finished’ the divergent stage of And (yet again, ‘diverge ‘til it hurts’), the final job is to start converging on our potential ‘answer’. Convergence here typically means, first of all looking to cluster clues possessing common themes, and then looking for good combinations. There are numerous ways to be objective about deciding what good means (Reference 5, Chapter 22), but often the simplest and most effective way is to focus on those clues that feel like the most intriguing or that you start to feel yourself getting passionate about, or the ones that seem to invoke some kind of a ‘wow’ reaction. Problem solving teams that have been embroiled in an intractable problem for a long time ‘know’ when they can finally see a way out.

No-one in the SI team is a domain expert in the world of academic incentives, but we do know that ‘someone, somewhere has solved the problem’ and so, as far as our first iteration of the COBRA+ process for this problem is concerned, we can at least say that the idea of having objective means of measuring the quality of academic research offers up an important potential step forward (we know this because we’ve created an equivalent tool for the world of patents – if you incentivise ‘number of patents’ you’ll quickly receive lots of patent applications. You’ll also see that very quickly their quality goes rapidly down-hill. The moment you know how to objectively measure quality and communicate it to inventors, both quantity and quality go up). Here’s our – outsiders – attempt to take that basic solution clue and combine it with some of the other emerging clues:

Solution Clues:

Figure 52 Completed ‘And’ Summary Template In Exemplar Case Study

We could declare that this ‘solution’ is the end of the story and start exposing it to prospective stakeholders, but really we ought to use the final ‘+’ step of the COBRA+ process to check that what we have really is a solution.

The ‘+’ task requires us to answer a number of evaluating questions: Is the solution good enough?

Well, difficult for us to know. It certainly feels okay, and we know it works in other domains, so maybe the answer is a cautious ‘yes’. There’s certainly nothing relating to the quality of the solution itself that would prevent us from exposing it to third parties.

Do all the stakeholders perceive a win?

Answering this one is a bit more problematic. We know from our earlier Outcome analysis that everyone likes to feel competent. This raises a possible danger with our research quality measurement solution that it reveals that my research work is not good. Such news will definitely tend to make people feel incompetent, and so we know we have the potential for a very clear impediment to the adoption of our solution. The same thing might well go for other stakeholders. The more we think about it, the more it feels like the answer to the question is ‘no’.

The moment we draw this conclusion, our answers to the subsequent ‘+’ questions are largely irrelevant. This is not a ’three out of four’ majority situation, if there’s a problem with any one answer, we know we are not going to be successful and that we haven’t finished. What we now need to do is head around to C for Compass again and contemplate another loop around the process…

…Ideally… researchers buy-in to and willingly adopt the quality assessment method…

…and we’re off again. Except maybe not here because our job of walking through the COBRA+ process is done. (The case study is a real one, by the way, so if any readers are desperately interested in the outcome of the second (and third) process cycle, keep your eye out for the write-up in the Systematic Innovation ezine.)

Finally, all we need to do here is refer intrigued problem-solvers wishing to give COBRA+ a try to head to the set of COBRA+ template sheets found at the back of the book. Or, if you want an electronic copy, to the systematic-innovation.com ‘Downloads’ page.

Contradiction Hierarchies & Root Contradictions

Knowledge of complex systems clearly reveals, as stated earlier, there is no such thing as a ‘root cause’. The Perception Map output from the COBRA+ process (see Figures 38 and 46 for example) reveal, at best, that the ‘root’ of a problem is a conspiracy of causes. In many cases, the Map will likely reveal two or more vicious cycle loops. In which case, we can’t even say that there is a single conspiracy of causes. ‘Solving’ problems where there are multiple different vicious cycles present, means that each vicious cycle needs to be successfully broken. The COBRA+ process enables and facilitates such activities because, wherever possible it has been designed to be a ‘self-correcting’ process. If, for example, at the end of a loop through C-O-B-R-A and we arrive at the feedback loop triggering ‘+’ stage, the questions we’re forced to think about will, by definition, force us to re-think what the problem we’re supposed to be working on next is.

That said, there is a possibility that, having made a couple of loops of the process, we begin to feel like we’re going around in a circle. Hopefully, the situation is rare, but it has happened often enough to us that we’ve felt it necessary to design a back-up plan. Hence, this section on ‘contradiction hierarchies. It is placed here after the COBRA+ section of the book by way of a ‘fall-back’ option if COBRA+ doesn’t get us to where we want to be. That said, we also know that some users of the following contradiction hierarchy mapping tool often use it as a stand-alone problem exploration tool. Others have begun to use it as a prelude to a COBRA+ exercise. As with all things, the tools are supposed to adapt to the user rather than the other way around. Our job here is to describe the tool so that individual readers can make up their own minds as to whether the Contradiction Hierarchy Template (CHT) has any place in their problem-solving armoury.

The start point for thinking about contradiction hierarchies is the Einstein quote, ‘You can never solve a problem on the level on which it was created’. There’s a similar quote, too, within the TRIZ world, it goes something like, ‘the customer is always right. Apart from the problem they’ve asked you to come and solve’. Humans, in other words, don’t seem to be too good at stepping outside their own realm of experience to see what their problems might look like from other peoples’ perspective.

Our CHT has been around for some time now – under the name, ‘Why-What’s-Stopping’ (WWS) – as a specific means of breaking out of the psychological inertia often associated with our difficulties in defining the ‘right’ problem. Or, to put it more kindly, to give ourselves a broader spectrum of options when it comes to determining what level of problem we really wish to take on.

Filling the Template will typically start in the middle, with the box marked, ‘Original Problem’. This is where we record our current perception of the problem we’d like to tackle. The Template then forces us to think about a couple of questions: ‘what’s stopping us from solving the problem?’ as a way of drilling down, and ‘why do we want to solve this problem?’ as a way of broadening it. The ‘what’s stopping’ question is a lot like the ‘Ideally, But…’ ‘B’ stage of the COBRA+ process. The main difference between what we see there and what we need to do with the CHT is that we use the answer to the question to formulate a narrower problem. And then we repeat the process, asking, ‘what’s stopping us?’ in relation to this narrower problem. And then we do it again. And potentially again. Until we reach a point where, if we’ve been clear in our thinking, we should have reached our ‘root contradiction’.

The top- part of the Template, meanwhile is all about repeatedly asking the ‘why?’ question. This will force us to broaden the problem, and as such challenge whether we need to shift our thinking to a more big picture strategic view of the world. The Template is shown here in Figure 52:

Figure 53 : Contradiction Hierarchy Template

As with nearly everything in and around the TRIZ world, it is often easier to see how the Template works through a tangible example. We do that here in Figure 53. The initial problem setting for this example is an increasingly common situation relating to the use of Artificial Intelligence (AI) in a business setting, and particularly the use of Machine-Learning Algorithms (MLA) that, in theory at least, allow the software system to ‘learn’ such that the more it is used the better it gets (see also Reference 32 for another perspective on the extent of the problem). MLAs require input data to train themselves, such that, if, for example, we’re trying to build an algorithm to detect whether an insurance claim from a customer is fraudulent, we need to ‘show’ the software examples of previous cases where fraud was found to be present. The problem – at least a typical initial problem statement that fills the middle box in the Template – is not being able to obtain sufficient useful training data.

There are a few learning points that hopefully emerge from examining the completed template:

1 When we’re moving in the narrowing direction, it is quite likely that when we ask the ‘what’s stopping?’ question, we realise that there are multiple answers. In the case of the Figure 53 template, two have been identified. In other cases it could be more. It is worth spending time being comprehensive in mapping out each of the ‘what’s stopping’ candidates, even though it inevitably means more work as we drill down to formulate the problem definition at the next level down. Fortunately, the drilling-down process tends to be strongly convergent, so the task should get progressively less onerous the further down we drill…

2 …in theory, however, there’s no limit to how many times we are able to keep drilling down. In this case, we’ve been able to drill down twice before hitting what feels like an and point. In actual fact two end points. Experience of using the Template for close to a couple of decades now reveals the heuristic that the ‘bottom’ of the story either involves a Physical Contradiction (our ‘root contradiction’) or what we typically refer to as a ‘knowledge problem’. This is the situation where ‘what’s stopping’ us is that we simply don’t know how to achieve what we need to achieve. In the Figure 53 example, we can actually see both end-points: there is the Physical Contradiction (‘we want lots of data and we want little data’) and there is a knowledge problem: someone needs to define ‘purpose’.

Figure 54 Exemplar Completed Contradiction Hierarchy Template

3 Once we’ve finished, if we look up and down the middle column of the Template, we can effectively see an overall problem hierarchy – in this case a range that spans solving a ‘lots-versus-little’ data issue or enabling meaningful decision to be made in complex environments. We can now – authority permitting – make a much more informed decision about the level we’re wanting to (or are empowered to) progress from. Whatever level we choose, we know we’ve already found a contradiction (i.e. we have a problem statement and a corresponding ‘what’s stopping us’ statement that forms the other side of the contradiction) and so can start using the Matrix to begin exploring solutions. We also know that, should our attempts to solve the problem at the chosen level, we can always return to the CHT and try tackling the problem at a different level. As with all things in and around TRIZ, the template’s job is to give a structure that allows users to deviate from at any time, safe in the knowledge that, should the deviation not prove fruitful, there’s always the possibility to return to the structure.

Business Matrix 3.0

1. Design Spec/Capability/Means

2. Design Cost

3. Design Time

4. Design Risk

5. Design Interfaces

6. Production Spec/Capability/Means

7. Production Cost

8. Production Time

9. Production Risk

10. Production Interfaces

11. Supply Spec/Capability/Means

12. Supply Cost

13. Supply Time

14. Supply Risk

15. Supply Interfaces

16. Support Spec/Capability/Means

17. Support Cost

18. Support Time

19. Support Risk

20. Support Interfaces

21. Customer Revenue

22. Market Demand

23. Customer Feedback

24. Customer Loyalty

25. Amount Of Information

26. Communication Flow

27. Convenience

28. Adaptability/Versatility

29. System Complexity

30. Control Complexity

31. Tension/Stress

32. Stability/Resilience

33. Autonomy

34. Belonging

35. Competence

36. Sense Of Progress

37. Catalysts/Nourishers (+ve Intangibles)

38. Inhibitors (-ve Intangibles)

39. Trust

40. Engagement

41. Meaning

42. Ability To Measure

43. Measurement Accuracy

44. Harmful Factors Affecting System

45. System Generated Harmful Factors

1. Parameter We Want to Improve – Design Spec/Capability/Means

Meanings: ‘Design’ perhaps implies a bias towards high technology industries – where the term is most frequently used. The meaning here, however is intended to be much more general; referring to all of those activities that occur in conceptualising, trialing, beta-testing, verifying and validating any kind of novel product, process or service before it is finalised and offered as a final entity to customers.

‘Specification/Capability/Means’ relate to quality related aspects of a product, process or service. Again intended to be general, the terms relate to the quality of what is produced, and the means by which we achieve it. The term should be interpreted to include both tangible and intangible elements – i.e. knowledge, emotional qualities, etc as well as physical artefacts or functional services.

Synonyms, Antonyms and Equivalent Meanings: business concept innovation, new product development, dream, moonshot, orbit-shifting, blue-sky, game-changer, artist’s impression, sketch, blueprint, R&D, proof-of-concept, demonstrator, pre-production, trial version, alpha, beta, experimental, novel, advanced, early-adopter products/services, bread-board, cutting-edge, ‘bleeding-edge’, push-the-envelope, Minimum-Viable-Product, Minimum-Viable-Demonstration, thought-leadership, fuzzy-front-end, Design-Thinking, win- win, divergence-convergence, Decision-Flow, Stage-Gate, Stage 0, exploration, output, defects, dead-end, concessions, rapid-prototyping and other advanced one-off manufacture and creation methods, certification standards, qualification activities.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

2, 10, 22, 25

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

25, 2, 13, 35, 10, 24, 7, 15, 3, 6, 19, 36, 5, 17, 23

List of Principles relevant to each specific worsening parameter:

Worsening Parameter

Description

List of Relevant Inventive Principles (decreasing order of frequency)

2. Parameter We Want to Improve – Design Cost

Meaning: ‘Design’ perhaps implies a bias towards high technology manufacturing industry

– where the term is most frequently used. The meaning here, however is intended to be much more general; referring to all of those activities that occur in conceptualising, trialing, beta-testing, verifying and validating any kind of novel product, process or service before it is finalised and offered as a final entity to customers.

Cost: anything relating to financial matters. Costs can be direct or indirect, visible or invisible, tangible or intangible. In the context of this parameter, ‘cost’ can also mean waste of money or other forms of financial resource.

Synonyms, Antonyms and Equivalent Meanings: price, subcontract cost, contingency, redundant costs, cost of unused fall-back options, investment-cost, opportunity-cost, sunk- cost, upfront cost, risk capital, overhead, R&D budget, R&D tax credits, R&D ROI, IP costs, Patent Box, valuation, seed-money, venture capital, government support funding, angel investor, kickstarter, crowdfunding, fund-raising, equity, skin-in-the-game, penalty clause, design-to-cost, design-to-value, cost-down innovation, bang-for-the-buck, pay-to-play, revenue-sharing-partnership, ball-park, guesstimate, fortune at the bottom of the pyramid.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

6, 10, 22, 25

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

10, 13, 2, 35, 25, 24, 1, 26, 19, 6, 7, 15, 27, 23, 37, 40

List of Principles relevant to each specific worsening parameter:

3. Parameter We Want to Improve – Design Time

Meaning: ‘Design’ perhaps implies a bias towards high technology manufacturing industry

– where the term is most frequently used. The meaning here, however is intended to be much more general; referring to all of those activities that occur in conceptualising, trialing, beta-testing, verifying and validating any kind of novel product, process or service before it is finalised and offered as a final entity to customers.

‘Time’; anything relating to temporal issues. This includes the time and level of effort required to do something, both visible and invisible, tangible and intangible. The emphasis here is on issues where time is the specific focus (in line with the axiom ‘time is money’, if we are interested in financial implications rather than the actual time itself, the ‘Cost’ parameter should be used in preference to this on).

Synonyms, Antonyms and Equivalent Meanings: agile, critical-path, parallel activities, sequential activities, waiting time, overtime, working hours, shift length, shift pattern, lost time, meeting time, standard hours, meetings, approval delay, launch-date, late, overdue, insufficient time, late-start, early-start, time-to-market, first-to-market, rapid-prototype, ‘fail- fast-fail-forward’, playing ‘catch-up’, fast-follower, rapid-reaction-force, pre-defined, decision-flow, ‘slow-hunch’, ‘ahead of the curve’, pulse-rate, cyclical, clockspeed, half-life, ‘ahead of the game’, leap-frog, ‘follow-the-sun’, fast-track, overnight, fast-lane, ‘royal-train’, top-priority, ‘first-past-the-post’, ‘too-little-too-late’, tipping-point, scrum, sprint, hackathon, normal- world/special-world, ‘the third act’, pre-suasion (Reference 33).

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

6, 10, 27, 38

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

2, 24, 25, 10, 7, 15, 35, 23, 13, 1, 26, 6, 37, 40, 19

List of Principles relevant to each specific worsening parameter:

4. Parameter We Want to Improve – Design Risk

Meaning: ‘Design’ perhaps implies a bias towards high technology manufacturing industry

– where the term is most frequently used. The meaning here, however is intended to be much more general; referring to all of those activities that occur in conceptualising, trialing, beta-testing, verifying and validating any kind of novel product, process or service before it is finalised and offered as a final entity to customers.

‘Risk’; matters associated with likelihood and consequences of things happening that will cause a deviation from established plans. Risk can, of course, be manifested in terms of quality, specification, time or cost. This parameter seeks to encourage users to focus on risk in its most general sense. Where a risk could apply to any or all of the cost, time or quality parameters, this is the one that should be used.

Synonyms, Antonyms and Equivalent Meanings: likelihood, consequence, probability of failure, chance, contingency, fall-back, safety-margin, alternative, tipping point, pivot, moving goal-posts, scope-creep, back-up, reserve, liability, infringement (IP), ‘design-for- Murphy’, strawman, robust design, stability, vulnerability, sensitivity, resilience, antifragile, escape-route, Plan-B, turbulence, analysis-paralysis, ‘afraid-of-heights’, ‘level-playing-field’, ‘low-hanging-fruit’, ground-rules, ‘ducks-in-a-row’, ambidextrous organization, nose-dive, paradigm-shift, ‘burning-platform’, risk-aversion, risk appetite, non-linear, unknown- unknowns, unpredictability, uncertainty, ambiguity, jeopardy, gamble, punt, lottery, ‘shot in the dark’, ‘shooting fish in a barrel’, audacious, feint, Trojan horse, espionage, ‘fifth-column’, decoy, interim, wiggle-room, ‘form the wagons into a circle’, retaliation, ‘tit-for-tat’, war-zone, ‘moment of madness’, manoeuvre, high-ground, nightmare scenario, status quo, divisive, subversion analysis, FMEA, Doomsday scenario, Hawthorne Effect, Occam’s Razor.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

6, 10, 15, 35, 36

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

13, 7, 15, 23, 10, 3, 35, 24, 1, 25, 2, 40, 9, 6, 26

List of Principles relevant to each specific worsening parameter:

5. Parameter We Want to Improve – Design Interfaces

Meaning: ‘Design’ perhaps implies a bias towards high technology ‘R&D’ or manufacturing industry – where the term is most frequently used. The meaning here, however is intended to be much more general; referring to all of those activities that occur in conceptualising, trialing, beta-testing, verifying and validating any kind of novel product, process or service before it is finalised and offered as a final entity to customers.

‘Interfaces’; issues relating to the connections that exist (or don’t exist but should) between different parts of a system. This may be interpreted as person-to-person, peer-to-peer, department-to-department, division-to-division, B2B, B2C or any other relationship between one entity and another. Interfaces can be internal or external, formal or formal, and there will always be elements of tangible and intangible interfaces. Interfaces can be verbal, written, legal, visual, etc.

If there is an interface issue relating to two different parts of an organisation – say between Design and production’ then this should be modelled as a conflict between the ‘Design Interfaces’ and ‘Production Interfaces’ parameters.

Synonyms, Antonyms and Equivalent Meanings: relationship, interaction, communication links, command structure, network, authority, peer, spoken, hand-shake, ‘old-pals act’, contract, not-invented-here, commanders-intent, edict, Voice-of-Customer, consumer panel, consumer advocate, customer-centric, perception, ‘the map is not the territory’, perspective, authority, rights, responsibilities, rivalry, respect, dependence, boot- strap, independence, interdependence, co-opetition, complementor, outlier, mentor, join- the-dots, holistic, touch-base, leverage, tail-wagging-dog, ‘singing from the same hymn sheet’, dispute, argument, consensus, agreement, protocol, cross-functional, Skunkworks, silo, ‘over-the-wall’, isolated, ‘out of the loop’, synergies, interactive, grid-lock, solitary.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

2, 12, 22, 27, 35

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

35, 13, 15, 40, 25, 24, 2, 10, 37, 6, 1, 7, 3, 5

List of Principles relevant to each specific worsening parameter:

6. Parameter We Want to Improve – Production Spec/Quality/Means

Meaning: ‘Production’ – any activities involved in the production or realisation of goods or services. In the case of manufactured articles, the meaning relates to all of those activities required to translate the designer’s intent into the product that the customer will eventually receive. In the service sector, the meaning is perhaps better interpreted as that collection of activities that are required to translate a customer’s wishes into the output they receive. In a retail banking transaction, for example, ‘production’ in this context involves all of the actions that take place immediately after the customer gives the teller an instruction, until the moment when that instruction has been successfully carried out (e.g. entry into system, confirmation, clearing, entry into account).

‘Specification/Capability/Means’ relate to quality related aspects of a product, process or service. Again intended to be general, the terms relate to the quality of what is produced, the capability available within an enterprise to achieve the desired output, and the means by which we achieve it.

Synonyms, Antonyms and Equivalent Meanings: manufacture, transaction, assembly, preparation, package, consistency, standard(s), output, defects, concessions, customer satisfaction, spc, process, repeatability, standard-deviation, sigma, mean, datum, variation, bespoke, customized, function, attributes, experience, load, capacity, JIT bottleneck, constraint, sentiment-score, ‘drum-buffer-rope’, Lean, SixSigma, operational-excellence, continuous-improvement, Kaizen, Plan-Do-Study-Act, DMADV, inspection, subcontractor quality, tolerance, Pareto, Value-Stream-Mapping, Toyota-Production-System, TPM, Takt- time, relevance, pull-system, flow, batch, failure-demand, top-down, bottom-up, command- and-control, business-process-reengineering, 5S, benchmarking, NPS, runner, repeater, stranger, Poka-Yoke, root-cause-analysis, ERP, WBS, supply-chain-(management), CRM.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

2, 10, 25, 35

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

13, 10, 35, 24, 2, 3, 25, 23, 7, 15, 5, 12, 1

List of Principles relevant to each specific worsening parameter:

7. Parameter We Want to Improve – Production Cost

Meaning: ‘Production’ – any activities involved in the production of goods or services. In the case of manufactured articles, the meaning relates to all of those activities required to translate the designer’s intent into the product that the customer will eventually receive. In the service sector, the meaning is perhaps better interpreted as that collection of activities that are required to translate a customer’s wishes into the output they receive. In a retail banking transaction, for example, ‘production’ in this context involves all of the actions that take place immediately after the customer gives the teller an instruction, until the moment when that instruction has been successfully carried out (e.g. entry into system, confirmation, clearing, entry into account).

Cost: anything relating to financial matters. Costs can be direct or indirect, visible or invisible, now or in the future. In the context of this parameter, ‘cost’ can also mean waste of money or other forms of financial resource.

Synonyms, Antonyms and Equivalent Meanings: manufacture, transaction, assembly, preparation, package, output, defects, concessions, customer satisfaction, variation, (selling) price, overhead, value, discount, Discounted-Cash-Flow, inventory, stock, assets, capital expenditure, operational expenditure, cost-of-defects, cost-of-lost-sales, invisible earnings, over-production, net-present-value, gross/net profit, return-on-investment, spent- cost, recoverables, non-recoverables, tax, liabilities, balance, profit-and-loss, run-rate, as- sold-estimate, bill-of-materials, escalation, man-hour, unit-cost, life-cycle-cost, through-life- cost, marginal cost, purchase cost, activity-based-costing, fixed, variable, capex, opex, break-even-point, cost-centre, profit-centre, EBITDA, depreciation, amortization, balance sheet, liabilities, equities, earned-value, double-entry-accounting, overtime, material resource planning, liquidity, KPIs, consumables, shutdown cost, abandonment cost, penalty clause, freemium.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

5, 10, 15, 25, 27, 35

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

10, 13, 25, 35, 24, 7, 1, 2, 5, 26, 3, 15, 37

List of Principles relevant to each specific worsening parameter:

8. Parameter We Want to Improve – Production Time

Meaning: ‘Production’ – any activities involved in the production of goods or services. In the case of manufactured articles, the meaning relates to all of those activities required to translate the designer’s intent into the product that the customer will eventually receive. In the service sector, the meaning is perhaps better interpreted as that collection of activities that are required to translate a customer’s wishes into the output they receive. In a retail banking transaction, for example, ‘production’ in this context involves all of the actions that take place immediately after the customer gives the teller an instruction, until the moment when that instruction has been successfully carried out (e.g. entry into system, confirmation, clearing, entry into account).

‘Time’; anything relating to temporal issues. This includes the time and level of effort required to do something, both visible and invisible, tangible and intangible. The emphasis here is on issues where time is the specific focus (in line with the axiom ‘time is money’, if we are interested in financial implications rather than the actual time itself, the ‘Cost’ parameter should be used in preference to this on).

Synonyms, Antonyms and Equivalent Meanings: manufacture, transaction, transaction rate, calls-per-hour, throughput, assembly-time, preparation-time, defect-identification-time, critical path, parallel activities, sequential activities, waiting time, overtime, working hours, shift length, shift pattern, lost time, downtime, meeting time, standard hours, meetings, approval delay, late, overdue, over-promise, takt-time, cycle-time, lead-time, pulse, response-time, average-handling-time, adherence, peak-hour-traffic, on-hold-time, longest- delay-in-queue, availability, average-speed-of-answer, service level, occupancy, absenteeism, utilization, employee turnover rate, visit-duration, return/re-visit frequency, churn rate, real-time, hourly/daily/weekly/monthly/seasonal variation, (knowledge) half-life.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

5, 10, 15, 25

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

13, 25, 10, 15, 2, 24, 7, 3, 35, 23, 9, 1, 19

List of Principles relevant to each specific worsening parameter:

9. Parameter We Want to Improve – Production Risk

Meaning: ‘Production’ – any activities involved in the production of goods or services. In the case of manufactured articles, the meaning relates to all of those activities required to translate the designer’s intent into the product that the customer will eventually receive. In the service sector, the meaning is perhaps better interpreted as that collection of activities that are required to translate a customer’s wishes into the output they receive. . In a retail banking transaction, for example, ‘production’ in this context involves all of the actions that take place immediately after the customer gives the teller an instruction, until the moment when that instruction has been successfully carried out (e.g. entry into system, confirmation, clearing, entry into account).

‘Risk’; matters associated with likelihood and consequences of things happening that will cause a deviation from established plans. Risk can, of course, be manifested in terms of quality, specification, time or cost. This parameter seeks to encourage users to focus on risk in its most general sense. Where a risk could apply to any or all of the cost, time or quality parameters, this Risk parameter is the one that should be used.

Synonyms, Antonyms and Equivalent Meanings: manufacture, transaction, throughput, critical path, likelihood, consequence, contingency, fallback, alternative, back-up, reserve, liability, robust systems, resilience, antifragile, Gaman, stability, vulnerability, sensitivity, complexity, priority-clash, emergency, back-up, liability, disruption, patent infringement, diversification, specialization, weather, disaster, Act-of-God, insurance, bubble, strikes, collapse, abandonment, fat-tail, upside, downside, (mistaking) special-cause/common- cause, negligence, waiver, dereliction of duty, bankruptcy, conceal, whitewash, (non-) compliance, quarantine, hazard, stockpile, FMEA, fault-tree, risk assessment, mitigation, counter-measures, preparedness, safety coefficient, uncertainty, worst-case-scenario, safeguard, buffer, hedge, anticipatory failure determination, HAZOP, bottleneck, audit.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

10, 25, 36, 37

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

25, 7, 24, 10, 2, 3, 9, 1, 26, 13, 5, 12, 19, 35, 37, 23, 15

List of Principles relevant to each specific worsening parameter:

Notes:

Inventive Principle 3, Localisation of risk often used in combination with Principle 39, Inert Atmosphere – i.e. the risky elements of a system are managed in a localised inert setting.

10. Parameter We Want to Improve – Production Interfaces

Meaning: ‘Production’ – any activities involved in the production of goods or services. In the case of manufactured articles, the meaning relates to all of those activities required to translate the designer’s intent into the product that the customer will eventually receive. In the service sector, the meaning is perhaps better interpreted as that collection of activities that are required to translate a customer’s wishes into the output they receive. In a retail banking transaction, for example, ‘production’ in this context involves all of the actions that take place immediately after the customer gives the teller an instruction, until the moment when that instruction has been successfully carried out.

‘Interfaces’; issues relating to the connections that exist (or don’t exist but should) between different parts of a system. This may be interpreted as person-to-person, peer-to-peer, department-to-department, division-to-division, B2B, B2C or any other relationship between one entity and another. Interfaces can be internal or external, formal or formal, tacit or explicit. Interfaces can be verbal, written, legal, visual, etc.

If there is an interface issue relating to two different parts of an organisation – say between Design and production’ then this should be modelled as a conflict between the ‘Design Interfaces’ and ‘Production Interfaces’ parameters.

Synonyms, Antonyms and Equivalent Meanings: manufacture, transaction, throughput, goodwill, relationship, interaction, communication links, command structure, network, authority, peer(-to-peer), spoken, hand-shake, edict, buy-in, people, perceptions, perspective, authority, rights, responsibilities, friendship, rivalry, dispute, (in-)dependence, argument, consensus, agreement, protocol, click-through-rate, tribunal, command-(and- control), government, governance, committee, arbitration, ombudsman, negotiation, regulation, certification, by-law, statute, mandate, vested interests, impartial, neutral observer, injunction, inspector, sponsor, expert, novice, trainer, apprentice, foreman.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

12, 23, 25, 36

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

10, 7, 2, 13, 25, 24, 3, 19, 40, 26, 15, 23, 5, 28

List of Principles relevant to each specific worsening parameter:

11. Parameter We Want to Improve – Supply Spec/Quality/Means

Meaning: ‘Supply’ – any activities associated with the delivery or supply of a finished product or service to the intended customer. In the product context the parameter should be interpreted as including all of the logistical elements associated with the packaging, transport, receipt, unpacking and confirmation of delivery of the thing that a customer has ordered. In the service sector, the meaning is perhaps better interpreted as that collection of activities that are required to supply or deliver the required service to the customer. In a retail banking transaction, for example, ‘supply’ in this context involves all of the actions that take place when the teller provides the customer with confirmation that an instruction has been successfully acted upon (e.g. through the arrival of a monthly bank statement). ‘Supply’ also includes the manner in which an organisation presents itself to its customers

– in the form of branding, advertising, appearance of store, etc.

‘Specification/Capability/Means’ relate to quality related aspects of a product, process or service. Again intended to be general, the terms relate to the quality of what is produced, and the means by which we achieve it. The term should be interpreted to include both tacit and explicit elements – i.e. knowledge qualities as well as procedural or functional services.

Synonyms, Antonyms and Equivalent Meanings: supplier, demand, shipping, goods-in, receiving, error, invoice, check-out, sales, sales assistant, appearance, brand image, advertising, customer satisfaction, loyalty, process, repeatability, standard deviation, datum, bench-mark, variation, bespoke, commodity, customized, experience, bottleneck, constraint, full-service, functional-sales, hire, relationship management, promotional activities, recruit, outsource, logistics, warehouse, bonded, brokerage, cargo, carrier, consignment, export, customs, declaration, fulfillment, gateway, handling, OEM, SKU, contractor, discharge, exempt, accredit, stock, Heijunka, inventory, private-label, slotting, build-to-order, upsell, downsell, mis-sell, purvey, qualify.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

5, 35

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

10, 13, 2, 35, 25, 5, 15, 23, 24, 7, 1, 19, 30, 3

List of Principles relevant to each specific worsening parameter:

12. Parameter We Want to Improve – Supply Cost

Meaning: ‘Supply’ – any activities associated with the delivery or supply of a finished product or service to the intended customer. In the product context the parameter should be interpreted as including all of the logistical elements associated with the packaging, transport, receipt, unpacking and confirmation of delivery of the thing that a customer has ordered. In the service sector, the meaning is perhaps better interpreted as that collection of activities that are required to supply or deliver the required service to the customer. In a retail banking transaction, for example, ‘supply’ in this context involves all of the actions that take place when the teller provides the customer with confirmation that an instruction has been successfully acted upon (e.g. through the arrival of a monthly bank statement). ‘Supply’ also includes the manner in which an organisation presents itself to its customers

– in the form of branding, advertising, appearance of store, etc.

Cost: anything relating to financial matters. Costs can be direct or indirect, visible or invisible, tangible or intangible. In the context of this parameter, ‘cost’ can also mean waste of money or other forms of financial resource.

Synonyms, Antonyms and Equivalent Meanings: shipping, goods-in, receiving, cost of shipping damage, error, invoicing mistakes, etc, cost-of-sales, import duty, export duty, cost of advertising, (supply) price, overhead, value, discount, inventory, stock, capital expenditure, operational expenditure, cost-of-lost-sales, invisible earnings, e-commerce, tariff, pre-paid, remittance, gain-sharing, revenue-share, loan, rent, lease, hire, hire- purchase, functional-sales, charter, commission, .

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

2, 5, 13, 35

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

7, 10, 35, 2, 25, 13, 5, 24, 1, 19, 15, 40

List of Principles relevant to each specific worsening parameter:

13. Parameter We Want to Improve – Supply Time

Meaning: ‘Supply’ – any activities associated with the delivery or supply of a finished product or service to the intended customer. In the product context the parameter should be interpreted as including all of the logistical elements associated with the packaging, transport, receipt, unpacking and confirmation of delivery of the thing that a customer has ordered. In the service sector, the meaning is perhaps better interpreted as that collection of activities that are required to supply or deliver the required service to the customer. In a retail banking transaction, for example, ‘supply’ in this context involves all of the actions that take place when the teller provides the customer with confirmation that an instruction has been successfully acted upon (e.g. through the arrival of a monthly bank statement). ‘Supply’ also includes the manner in which an organisation presents itself to its customers – in the form of branding, advertising, appearance of store, etc.

‘Time’; anything relating to temporal issues. This includes the time and level of effort required to do something, both visible and invisible, tangible and intangible. The emphasis here is on issues where time is the specific focus (in line with the axiom ‘time is money’, if we are interested in financial implications rather than the actual time itself, the ‘Cost’ parameter should be used in preference to this on).

Synonyms, Antonyms and Equivalent Meanings: shipping, goods-in, receiving, calls- per-hour, throughput, preparation-time, shipping delay, late, on-time performance, instant access, convenience, overnight, expiry, overdue, over-promise/under-deliver, waiting-time, tipping-point, ‘stickiness’, reservation, schedule, timetable, distraction, ETA, ETD, FIFO, in- transit, transit-time, churn-rate, shelf-life, synchronization, takt-time, cycle-time, pulse, response-time, average-handling-time, adherence, peak-hour-traffic, continuity, on-hold- time, availability, average-speed-of-answer, service level, occupancy, utilization, interim, real-time, hourly/daily/weekly/monthly/seasonal variation, sell-by-date, extended-stay, time- share, return/re-visit frequency, pop-up, mobility, stopgap, temporary, rent, lease.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

7, 10, 25

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

10, 13, 35, 24, 2, 7, 25, 15, 19, 1, 5, 37, 12

List of Principles relevant to each specific worsening parameter:

14. Parameter We Want to Improve – Supply Risk

Meaning: ‘Supply’ – any activities associated with the delivery or supply of a finished product or service to the intended customer. In the product context the parameter should be interpreted as including all of the logistical elements associated with the packaging, transport, receipt, unpacking and confirmation of delivery of the thing that a customer has ordered. In the service sector, the meaning is perhaps better interpreted as that collection of activities that are required to supply or deliver the required service to the customer. In a retail banking transaction, for example, ‘supply’ in this context involves all of the actions that take place when the teller provides the customer with confirmation that an instruction has been successfully acted upon (e.g. through the arrival of a monthly bank statement). ‘Supply’ also includes the manner in which an organisation presents itself to its customers

– in the form of branding, advertising, appearance of store, etc.

‘Risk’; matters associated with likelihood and consequences of things happening that will cause a deviation from established plans. Risk can, of course, be manifested in terms of quality, specification, time or cost. This parameter seeks to encourage users to focus on risk in its most general sense. Where a risk could apply to any or all of the cost, time or quality parameters, this is the one that should be used.

Synonyms, Antonyms and Equivalent Meanings: shipping, goods-in, receiving, likelihood, consequence, contingency, fall-back, alternative, back-up, reserve, liability, ‘Murphy’s Law’, robust systems, trial, stability, vulnerability, sensitivity, priority-clash, emergency back-up, liability, disruption, dangerous goods, trace-ability, warrant, guarantee, bullwhip effect, embargo, unplanned, interim, insure, special-cause/common-cause, negligence, waiver, dereliction of duty, bankruptcy, conceal, whitewash, (non-) compliance, quarantine, hazard, stockpile, FMEA, fault-tree, risk assessment, mitigation, counter- measures, preparedness, safety coefficient, uncertainty, worst-case-scenario, safeguard, buffer, hedge, care-package .

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

2, 25, 37

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

2, 10, 24, 25, 13, 7, 35, 5, 40, 15, 19, 9, 12

List of Principles relevant to each specific worsening parameter:

15. Parameter We Want to Improve – Supply Interface

Meaning: ‘Supply’ – any activities associated with the delivery or supply of a finished product or service to the intended customer. In the product context the parameter should be interpreted as including all of the logistical elements associated with the packaging, transport, receipt, unpacking and confirmation of delivery of the thing that a customer has ordered. In the service sector, the meaning is perhaps better interpreted as that collection of activities that are required to supply or deliver the required service to the customer. In a retail banking transaction, for example, ‘supply’ in this context involves all of the actions that take place when the teller provides the customer with confirmation that an instruction has been successfully acted upon (e.g. through the arrival of a monthly bank statement). ‘Supply’ also includes the manner in which an organisation presents itself to its customers – in the form of branding, advertising, appearance of store, etc.

‘Interfaces’; issues relating to the connections that exist (or don’t exist but should) between different parts of a system. This may be interpreted as person-to-person, peer-to-peer, department-to-department, division-to-division, B2B, B2C or any other relationship between one entity and another. Interfaces can be internal or external, formal or formal, and there will always be elements of visible and invisible (tacit) interfaces. Interfaces can be verbal, written, legal, visual, etc.

If there is an interface issue relating to two different parts of an organisation – say between supply and production’ then this should be modelled as a conflict between the ‘Supply Interfaces’ and ‘Production Interfaces’ parameters.

Synonyms, Antonyms and Equivalent Meanings: shipping, goods-in, receiving, goodwill, relationship, interaction, connection, empathy, richness, reach, media, multi-media, inspirational, aspirational, communication links, command structure, network, spoken, face- to-face, remote, distance, hand-shake, ‘old pals act’, edict, perceptions, perspective, authority, rights, responsibilities, friendship, complementor, competitor, respect, dependence, independence, dispute, argument, consensus, agreement, protocol, last-mile, licensing agreement, NDA, wholesaler, agent, intermediary, distributor, reseller, interpreter, compatible, partner-match, sympatico, buddy-system, middleman, freelance, stool-pigeon, go-between, B2B, B2C, B2G, P2P, vertical/horizontal integration, curator, fractional- ownership, PA, subscribe, membership, intermediary, dis-intermediation, bundled, butler, care-package.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

5, 12, 25

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

10, 25, 5, 13, 24, 35, 2, 7, 3, 40, 15, 4, 37

List of Principles relevant to each specific worsening parameter:

16. Parameter We Want to Improve – Support Spec/Quality/Means

Meaning: ‘Support’ – all of those activities after the customer has purchased and received the product or service they have ordered. In the case of products, this is likely to include things like maintenance, reliability, life and after-life (recycling for example) of that product. In the case of services –which tend to feature a multitude of contacts with the customer, the ‘support’ parameter should be used for all of those after-sales activities that occur following the first contact after customer commitment has been received. The period over which the support activities may last can be minutes to decades depending on the different market. As more and more organisations shift to service, function or ‘experience’ based business models, the ‘support’ timeframe becomes increasingly important.

‘Specification/Capability/Means’ relate to quality related aspects of a product, process or service. Again intended to be general, the terms relate to the quality of what is produced, and the means by which we achieve it. The term should be interpreted to include knowledge as well as physical artifacts or functional services.

Synonyms, Antonyms and Equivalent Meanings: after-sale, customer relationship, customer-care, package, process, function, reliability, durability, longevity, life-cycle design, robust design, ‘design-for-Murphy’, accidental damage, through-life design, warranty, extended-warranty, lifetime guarantee, maintenance-contract, replace-with-new, lease, lend-lease, buy-back, re-usable, recyclable, environmental impact, sustainability, life-brand, customer satisfaction, loyalty, repeatability, standard deviation, sigma, mean, datum, bench-mark, variation, bespoke, partnership, customized, experience, feedback, ‘working- together-team’, single-point-contact, user conference, upgrade, loyalty scheme, spin-off, end-game, virtual, curation, caretaker, out-source, subcontract, brain-drain, talent management, training, continuity, coherence, synergy, archive, corporate memory, tacit.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

2, 7, 15, 23, 25

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

25, 35, 10, 24, 7, 2, 13, 29, 5, 40, 15, 1

List of Principles relevant to each specific worsening parameter:

17. Parameter We Want to Improve – Support Cost

Meaning: ‘Support’ – all of those activities after the customer has purchased and received the product or service they have ordered. In the case of products, this is likely to include things like maintenance, reliability, life and after-life (recycling for example) of that product. In the case of services –which tend to feature a multitude of contacts with the customer, the ‘support’ parameter should be used for all of those after-sales activities that occur following the first contact after customer commitment has been received. The period over which the support activities may last can be minutes to decades depending on the different market. As more and more organisations shift to service, function or ‘experience’ based business models, the ‘support’ timeframe becomes increasingly important.

Cost: anything relating to financial matters. Costs can be direct or indirect, visible or invisible, formal or informal. In the context of this parameter, ‘cost’ can also mean waste of money or other forms of financial resource.

Synonyms, Antonyms and Equivalent Meanings: after-sale, customer-care, reliability- cost, life-cycle-cost, through-life cost, operating expenses, disposal cost, environmental cost, social cost, offset, retirement cost, pension, warranty costs, maintenance-contract, lease, lend-lease, buy-back, re-use, repeat business cost, follow-on sale revenue, mass- customization, resale value, liability cost, insurance, pension, brand-equity, bankruptcy, asset depreciation, appreciation, toxic asset, self-financing, allowed revenue, cost-plus pricing, administration, over-run, shortfall, compound interest, revenue-share, recurring, one-off, outcome-based-pricing.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

5, 7, 10, 12, 25

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

25, 10, 35, 7, 2, 24, 13, 5, 15, 29, 3, 17, 1, 32

List of Principles relevant to each specific worsening parameter:

18. Parameter We Want to Improve – Support Time

Meaning: ‘Support’ – all of those activities after the customer has purchased and received the product or service they have ordered. In the case of products, this is likely to include things like maintenance, reliability, life and after-life (recycling for example) of that product. In the case of services –which tend to feature a multitude of contacts with the customer, the ‘support’ parameter should be used for all of those after-sales activities that occur following the first contact after customer commitment has been received. The period over which the support activities may last can be minutes to decades depending on the different market. As more and more organisations shift to service, function or ‘experience’ based business models, the ‘support’ timeframe becomes increasingly important.

‘Time’; anything relating to temporal issues. This includes the time and level of effort required to do something, both visible and invisible, formal and informal. The emphasis here is on issues where time is the specific focus (in line with the axiom ‘time is money’, if we are interested in financial implications rather than the actual time itself, the ‘Cost’ parameter should be used in preference to this on).

Synonyms, Antonyms and Equivalent Meanings: after-sale, customer relationship, customer-care, package, process, reliability, durability, longevity, life-cycle, meant-time- between-overhaul, meant-time-between-failure, through-life design, warranty period, lifetime guarantee, lease period, loyalty-effect, memory, long-term partnership, retirement, post-retirement, recovery-time, time-to-maturity, incubation-period, time-limit, trial period, (de-)commissioning period, call response time, adherence to schedule, calendar, timetable, appointments, personal organizer, chronicle, end-of-life, disposal, cradle-to-cradle, attrition rate.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

2, 5, 10, 25

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

10, 25, 35, 2, 7, 24, 13, 15, 5, 23, 40, 1, 4

List of Principles relevant to each specific worsening parameter:

19. Parameter We Want to Improve – Support Risk

Meaning: ‘Support’ – all of those activities after the customer has purchased and received the product or service they have ordered. In the case of products, this is likely to include things like maintenance, reliability, life and after-life (recycling for example) of that product. In the case of services –which tend to feature a multitude of contacts with the customer, the ‘support’ parameter should be used for all of those after-sales activities that occur following the first contact after customer commitment has been received. The period over which the support activities may last can be minutes to decades depending on the different market. As more and more organisations shift to service, function or ‘experience’ based business models, the ‘support’ timeframe becomes increasingly important.

‘Risk’; matters associated with likelihood and consequences of things happening that will cause a deviation from established plans. Risk can, of course, be manifested in terms of quality, specification, time or cost. This parameter seeks to encourage users to focus on risk in its most general sense. Where a risk could apply to any or all of the cost, time or quality parameters, this is the one that should be used.

Synonyms, Antonyms and Equivalent Meanings: after-sale, risk-share partnership, longevity, liability, insurance, assurance, terms of warranty/guarantee, amortisation, ‘Murphy’s Law’, no-strings, accidental damage, environmental impact, retrospective damages, indemnity, robustness, stability, vulnerability, sensitivity, emergency back-up, disruption, bankruptcy, investigation, termination, residual risk, risk appetite, risk register, contingency plan, force majeure, stress-testing, abandonment, breach of contract, default, salvage, Trojan Horse, espionage, confidentiality breach, leak, extortion, blackmail, judicial review.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

10, 25, 36

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

25, 10, 35, 2, 13, 24, 7, 5, 9, 40, 24, 23

List of Principles relevant to each specific worsening parameter:

20. Parameter We Want to Improve – Support Interfaces

Meaning: ‘Support’ – all of those activities after the customer has purchased and received the product or service they have ordered. In the case of products, this is likely to include things like maintenance, reliability, life and after-life (recycling for example) of that product. In the case of services –which tend to feature a multitude of contacts with the customer, the ‘support’ parameter should be used for all of those after-sales activities that occur following the first contact after customer commitment has been received. The period over which the support activities may last can be minutes to decades depending on the different market. As more and more organisations shift to service, function or ‘experience’ based business models, the ‘support’ timeframe becomes increasingly important.

‘Interfaces’; issues relating to the connections that exist (or don’t exist but should) between different parts of a system. This may be interpreted as person-to-person, peer-to-peer, department-to-department, division-to-division, B2B, B2C, B2G or any other relationship between one entity and another. Interfaces can be internal or external, formal or informal, and there will always be elements of visible or hidden interfaces. Interfaces can be verbal, written, legal, visual, etc.

If there is an interface issue relating to two different parts of an organisation – say between support and production’ then this should be modelled as a conflict between the ‘Support Interfaces’ and ‘Production Interfaces’ parameters.

Synonyms, Antonyms and Equivalent Meanings: after-sale, customer relationship, customer-care, package, maintenance-contract, life-style, life-brand, customer satisfaction, loyalty, repeat business, partnership, experience, feedback, ‘working-together-teams’, transformation, loyalty, iconic, collaboration, social impact, user-group, special-interest- group, user network, committee, family, cluster, complementors, vertical/horizontal integration, unbundling, franchise, exemption, immunity, ring-fence, separate, boundary, partition, dividing-line, fringe, inner/outer circle, remote, on-site, satellite, subsidiary, knowledge-transfer partnership, incubator, community, league, alliance, syndicate, fraternity, intermediary/dis-intermediation, alumni, temp.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

7, 10, 24

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

10, 7, 25, 24, 35, 13, 2, 5, 23, 40, 12

List of Principles relevant to each specific worsening parameter:

21. Parameter We Want to Improve – Customer Revenue

Meaning: The transactional finance-related things that come back to the supplier from the customer. Revenue received is the most tangible manifestation of how well an enterprise is serving the needs of their customers and delivering value to them. The enterprise enables customers to achieve the jobs and outcomes they are wishing to achieve, and ‘revenue’ is what those customers then provide back to the enterprise, usually in the form of money. The key concept of this parameter is that of closing the loop back from the customer to the supplier. Includes direct and indirect, visible and invisible, explicit and implicit, one-off or recurring, scheduled or random revenue matters.

Communication issues where a problem exists between the customer and a part of an organisation is best modelled by matching this parameter with the relevant ‘Interface’ element in parameters 5, 10, 15 and 20.

Synonyms, Antonyms and Equivalent Meanings: sale, cash, income, order, purchase- order, pricing, payment, invoice, account(s), profit, profit-margin, loss, bonus, discount, receipts, turnover, yield, proceeds, gains, earnings, ROI, gross, net, recoup, repeat- business, recurring, one-off-payment, close-the-deal, license-income, royalties, debtor, late/deferred payment, default, auction, fixed/variable rate, pre-payment, advance, offer, best-and-final-offer, barter, haggle, exchange, in-kind, contract, cash-in-advance, fee, commission, reseller, wholesale, retail, deal, transaction, disposal, bargain, rip-off, exploit, extort, settlement, agreement, terms, terms-and-conditions, stipulate, limit, rein, restriction, curtailment, suspend, penalty, guarantor, sponsor, surety, collateral, deposit, bond, warranty (claim), gratuity, tip, lifetime-value, honorarium, deferral, prohibit, ban, cancel, embargo, boycott, moratorium, injunction, postponement, hiatus, breathing-space, crowd- fund.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

7, 23, 25, 36

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

25, 13, 7, 35, 10, 24, 2, 5, 17, 40, 3, 15

List of Principles relevant to each specific worsening parameter:

22. Parameter We Want to Improve – Market Demand

Meaning: Demand is the quantity of a good or service that consumers and businesses are willing and able to buy at a given price in a given time period. Market demand is the sum of the individual demand for a product from buyers in the market. Demand is typically outside the direct control of sellers, and as such typically acts as a direct corollary to ‘supply’, i.e. what the seller is able to provide in order to meet the demand. In traditional industries, the usual aim of sellers is to manage supply and demand in such a way that they maximise profits by restricting supply. In network economies, where demand is likely to grow exponentially, at least for a period, supply and demand will no longer be in conflict since demand creates more demand (e.g. smartphones). This parameter concerns itself with any and all forms of such ‘demand’ as it might exist beyond the boundaries of a seller. Unlike the preceding, ‘Customer Revenue’ parameter which is intended to be interpreted as a transactional entity between entities, Market Demand is concerned with the bigger-picture market conditions within which an enterprise operates.

Synonyms, Antonyms and Equivalent Meanings: engagement, recommendations, desire, need, desire, wish, aspiration, experience, request, relevance, involvement, brand- awareness, lifestyle involvement, choice, commitment, pull, push, saturation, share-of- wallet, share-of-mind, receptivity, trial, taster, aggregate, segmentation (geographic, demographic, psychographic, behavioural), stability, dynamics, variety, outcomes, ‘jobs-to- be-done’, Rule-Of-Three (markets consolidate on three major players), niche, mainstream, full-service, confusion, sated, inertia, fatigue, apathy, indulgent, commoditized, luxury, intimacy, participation, pyramid-scheme, party-plan, Ponzi, continuity, craving, longing, yearning, hankering, hunger, thirst, passion, relish, avidity, ardour, urge, addiction, itch, ache, enthusiasm, keenness, eagerness, desire, liking, fancy, inclination, propensity, proclivity, partiality, preference, permission (based marketing), limit, Blue Ocean, white- space, (nature abhors a) vacuum, acquiesce, lead-customer, long-tail, Black Swan.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

5, 7, 15, 23, 25, 36

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

10, 25, 24, 13, 35, 15, 1, 2, 7, 5, 40, 3

List of Principles relevant to each specific worsening parameter:

23. Parameter We Want to Improve – Customer Feedback

Meaning: Information coming directly or indirectly from customers about the satisfaction or dissatisfaction they feel with a product or a service. Customer comments and complaints given to a company are an important resource for improving and addressing the current and future needs and wants of the customer. Customer feedback can be gathered informally, as through casual conversation, or formally, such as through surveys. Feedback can also be gathered when customers contact staff directly with specific questions, suggestions or complaints, whether offered in person, over the phone, or via correspondence such as e- mail. A less direct, more informal type of customer feedback can come from satisfied customers referring your products and services to others. The meaning intended in this parameter is the flow and correct interpretation of feedback information from customers into an enterprise.

Synonyms, Antonyms and Equivalent Meanings: survey, questionnaire, interview, study, canvass, poll, cross-examine, investigate, study, trial, probe, dialogue, sample, observation, bias, consumer-panel, Net Promoter Score (promoters, passives, detractors), PanSensic, immersion, sentiment analysis, anthropology, sociology, blind-tasting, ambiguated signifier, mystery-shopper, surveillance, shadow, visit Gemba, detector, scanner, recorder, observer, watchdog, overseer, invigilator, interrogate, representative, statistically significant, insight, negotiation, enquiry, cooling-off period, customer journey mapping, lifecycle, satisfaction, touch-point, social-media, unstructured narrative, scrape, facial-coding, micro-expressions, micro-tones, advocacy, vested interests, stickiness, benchmark, feedback-loop, live-chat, onboarding, tone, troubleshoot, cookie, avatar, virtual, face-to-face, decompose, dissect, dashboard, predictive, feed-forward, pattern, trend, Data Protection Act, privacy, intrusion, invasive, obtrusive, interrupting, trespassing, unwanted, unwelcome, meddling, interfering, busybody, inquisitive, prying, pushy, nosy.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

7, 10, 25, 32, 37

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

13, 25, 10, 7, 35, 24, 26, 3, 28, 17, 5, 2, 37, 32

List of Principles relevant to each specific worsening parameter:

24. Parameter We Want to Improve – Customer Loyalty

Meaning: Customer loyalty can be said to have occurred if people choose to use a particular shop or buy one particular product, rather than use other shops or buy products made by other companies. Customers exhibit loyalty when they consistently purchase a certain product or brand over an extended period of time. Customers are beyond the direct control of solution providers and as such this parameter is primarily concerned with the actions such providers can undertake in order to create, encourage, foster and maintain loyalty. The focus is on the more tangible aspects of the loyalty phenomenon. When considering specifically the intangible and emotional aspects of loyalty, the ‘Belonging’ parameter should be the preferred choice.

Synonyms, Antonyms and Equivalent Meanings: brand, allegiance, faithfulness, true, fidelity, obedience, fealty, adherence, retention, homage, devotion, bond, trueness, steadfastness, staunch, dependability, duty, constancy, dedication, commitment, stickiness, affinity, rapport, enticement, maintain, keep, loyalty-scheme, recognition, continuity, lifetime membership, preserve, reserve, conserve, perpetuate, unfailing, patriotic, unwavering, resonance, faithful, promiscuous, disloyal, treachery, brand-fatigue, time-out, breathing-space, alienation, churn, detach, distance, estrange, isolate, transfer, hostility, lost-confidence, drive-a-wedge-between, sow-dissension, dis-engage, extricate, de-couple, break-up, divorce, release, no-fault clause, win-back, annul, dissolution, binding, undiscriminating, unselective, irresponsible, haphazard, thoughtless, unthinking, unconsidered, casual, careless, let-down, abandoned, disappoint, lapse, fickle, capricious, changeable, volatile, mercurial, vacillating, fitful, irregular, erratic, mutable, protean, chameleon-like.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

6, 10, 23, 25

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

7, 13, 10, 1, 25, 24, 19, 2, 35, 33, 32, 5

List of Principles relevant to each specific worsening parameter:

25. Parameter We Want to Improve – Amount of Information

Meaning: The amount, quantity or number of a system's informational resources. ‘Information’ should be interpreted in its most generic form to include any form of information that might be passed between two or more people, departments, divisions or systems in general, whether it be tangible or intangible, explicit or implicit. Also includes instances in which information is lost or is in danger of being lost. When this parameter is being used, it may be because of a problem of too much information or too little information. Given the progression of value inherent in the progression from data to information to knowledge to wisdom, this parameter should also be interpreted to encompass all four.

Synonyms, Antonyms and Equivalent Meanings: data, knowledge, wisdom, context, memory, properties, richness, accuracy, precision, credence, validity, message, volume, capacity, excess, absence, missing, forgotten, storage, archive, library, repository, retrieval, recovery, summary, detection, search, identification, database, tagged, Big Data (Analytics), Cloud, tacit, implied, understanding, interpret, transmitted, receiving, fidelity, faithfulness, relevance, exactness, closeness, truth, truthfulness, veracity, authenticity, realism, access, verisimilitude, cross-reference, validate, signal/noise, learning/unlearning, ‘flying-blind’, error, miscalculation, slip, mistake, fallacy, oversight, fault, crude, knowledge- gap, bias, confirmation-bias, distortion, assumptions, omission, misinterpret, misconstrue, knowledge-management, immediate, instant, real-time, lag, confidentiality, trade-secret, patent, intellectual property, operating manual, recipe, compendium, synopsis, abstract, repository, raw, insight, ‘needle in a haystack’, domain, fact, truth, first-principles, core, universal, context-specific, guess, intuition, instinct, requisite, vital, indispensable, formula, algorithm, implied, heuristic, indicator, alarm, dashboard.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

6, 25, 37

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

25, 37, 13, 7, 10, 2, 28, 4, 35, 24, 32, 19, 15

List of Principles relevant to each specific worsening parameter:

26. Parameter We Want to Improve – Communication Flow

Meaning: Aspects relating to the flow of communication. Other parameters like the various versions of ‘interface’ or ‘customer feedback’ are intended to deal with the interpretation and use of whatever it is that is being communicated; this parameter is specifically focused on the ability and means by which the communication moves. Strategies for solving communication flow problems are often considerably different from the ones used when that communication is generated or interpreted, and hence the inclusion of ‘flow’ as a separate parameter in the Matrix.

Synonyms, Antonyms and Equivalent Meanings: flow, transmission, channels, networks, links, nodes, mode, inertia, resistance, delay, lag, noise, corruption, interference, integrity, resolution, intensity, modulation, amplification, attenuation, bandwidth, speed, (multi-)media, public, private, underground, whisper, buzz, ‘word-on-the-street’, ‘between- the-lines’, tangible, intangible, medium, conversation, cascade, formal/informal, broadcast, relay, open/closed, ‘under-the-radar’, covert, whisper, rumour, programme, show, presentation, PowerPoint, slide-deck, feature, telecast, videocast, podcast, Social Media, YouTube, video, blockage, obstruction, stoppage, clot, occlusion, impediment, hindrance, congestion, clog (up), stop up, choke, plug, obstruct, gum up, occlude, dam up, congest, jam, gridlock, dead-end, saturation, barrier, closed, terminate, trickle(-down), top-down, bottom-up, sporadic, censor, flood, ‘drinking from a firehose’, expurgate, redact, cut, delete, viral, sticky, longevity, echo, silence, speechless, wordless, voiceless, dumb, mute, taciturn, reticence, uncommunicative, unresponsive, dead-air, shy, modest, taboo, veto, ban, proscription, prohibit.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

6, 7, 10, 12

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

25, 6, 2, 10, 13, 7, 4, 37, 24, 40, 12, 36

List of Principles relevant to each specific worsening parameter:

27. Parameter We Want to Improve – Convenience

Meaning: The state of being able to proceed with something without difficulty. The quality of being useful, easy, or suitable for someone. The extent and ease with which people are able to learn how to learn, operate or control a system whether it be a product, process or service. Convenience of use. Now that many products and services provide customers with all the performance and reliability they demand, ‘convenience’ is the next major stop in the customer purchase decision hierarchy, and hence the reason it merits its own entry in the Business Matrix.

Synonyms, Antonyms and Equivalent Meanings: benefit, use, enjoyment, comfort, ease, satisfaction simplicity, complexity, learnability, operability, training, education, usability, user guide, manual, help-file, help-line, call-centre, learning-curve, self-learning, familiarisation- time, ease-of-use, labour-saving, effort, intelligence (of system), smart, instinctive, anticipatory, consistency, predictability, transferability, automated, push-button, preprogrammed, computerized, electronic, robotic, unmanned, autonomous, self-directing, self-activating, self-regulating, self-executing, instinctive, involuntary, unconscious, reflex, knee-jerk, reflexive, subconscious, unconditioned, spontaneous, impulsive, unthinking, unpremeditated, unintentional, unintended, unbidden, unwitting, inadvertent, habitual, convoluted, elaborate, impenetrable, serpentine, labyrinthine, tortuous, tangled, Byzantine, Daedalian, Gordian, confusing, bewildering, baffling, puzzling, perplexing, bewilder, bemuse, baffle, mystify, confound, nonplus, flummox, discombobulate.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

2, 5, 10, 12, 19

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

25, 2, 13, 15, 10, 19, 24, 1, 35, 5, 7, 9

List of Principles relevant to each specific worsening parameter:

28. Parameter We Want to Improve – Adaptability/Versatility

Meaning: The extent to which a system, an organisation or person is able to respond to change. Also, relates to a system’s ability to be used in multiple ways or under a variety of circumstances. The need for change may originate within or beyond the system, organization or entity under consideration. When changes are responded to reactively, this corresponds to the resilience of a system. When changes are proactively triggered, ‘adaptability’ is all about the ability of the system to innovate. Resilience and innovation are thus seen as opposing sides of the same coin – one being the ability to adapt to external step-change, the other being the ability to successfully create and commercialise step- change.

Synonyms, Antonyms and Equivalent Meanings: adaptive, dynamic, step-change, resilience, antifragile, innovation, modify, alter, adjust, adjust, convert, transform, redesign, restyle, refashion, remodel, reshape, revamp, rework, redo, reconstruct, reorganize, customize, tailored, continuous improvement, amend, refine, tweak, rigidity, tolerance, smart-systems, universality, switchable, tunable, configurable, user-configurable, re- configurable, one-size-fits-all, slot-in solutions, modular, Hoshin, bespoke, personalize, individualized, time-variant, seasonal, two-in-one, all-in-one, multi-purpose, multi-functional, acclimatize, accommodate, attune, habituated, acculturated, conformable, habituated, pliable, supple, bendable, pliant, malleable, yielding, mouldable, stretchable, workable, ductile, plastic, elastic, fluid, free-flowing, flowing, fluent, smooth, effortless, natural, graceful, elegant, rhythmic, static, rigid, hard, solid, unyielding, resistant, solidified, hardened, stiff, inflexible, inelastic, frozen, ossified, stubborn, obstinate, unyielding, unbending, uncompromising, deaf, one-trick-pony, jack-of-all-trades, can’t-teach-on-old- dog-new-tricks, set-in-their-ways, one-dimensional, unrelenting, inexorable, iron-willed, iron-triangle.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

12, 25, 30, 35, 36

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

15, 1, 25, 35, 13, 7, 40, 2, 19, 17, 30, 24, 29, 10

List of Principles relevant to each specific worsening parameter:

29. Parameter We Want to Improve – System Complexity

Meaning: The number and diversity of elements, people, components, etc and their interrelationships within and across the boundaries of a system. The system may be internal or external to an organisation, or a combination of both. Includes issues like number of functions, number of interfaces and connections, excessive number of elements. Includes intangible as well as tangible parts and links between parts. This is the parameter to use when the ‘big picture’ perspective of a complex system is the issue under investigation. Always worth keeping in mind when attempting to distil the complexity down to ‘first principles’ is the TRIZ ‘Law Of System Completeness’. This tells us any ‘system’ demands Coordination, Sensor, Tool, Interface, Transmission and Engine elements. See also Stafford Beer’s ‘Viable System Model’ (Reference 34), and the PanSensic Complexity Landscape (Reference 35), which tells us that any business system involving two or more humans is inherently complex, and quite possibly teetering on the edge of chaos.

Synonyms, Antonyms and Equivalent Meanings: network, web, chaos, edge-of-chaos, complex systems, emergent, interdependent, feedback-loops, value-stream, boundary conditions, reach, interactions, holistic, small-world, whole-world, ‘it’s the whole thing, stupid’, hierarchy, butterfly-effect, ‘rat’s-nest’, ‘corporate hairball’, unexpected outcomes, ripple-effect, relationship network, population dynamics, perceptions, right-versus-wrong, right-versus-right, tipping point, cliff-edge, non-linear, cause-and-effect, viability (viable systems theory), entanglement, framework, culture, requisite variety (Ashby), simple, Keep It Simple, Stupid (KISS), clockwork, complicated, isolated, intricate, convoluted, tangled, elaborate, serpentine, labyrinthine, tortuous, impenetrable, nexus, multiplex, compound, composite, impenetrable, unpredictable, unwieldy, unruly, disorderly, rowdy, out of hand, ‘Wild-West’, ill-disciplined, undisciplined, recalcitrant, intractable, impossible, obstreperous, fractious, wayward, drift, dysfunction.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

7, 23, 25, 36

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

35, 25, 13, 10, 19, 2, 37, 7, 24, 23, 5, 26

List of Principles relevant to each specific worsening parameter:

30. Parameter We Want to Improve – Control Complexity

Meaning: Complexity of the means of control of a system – either the people, people- interfaces or physical components or the algorithms that it contains – used to enable a system to deliver useful functions. Like the preceding ‘system complexity’ parameter, this one assumes a high-level, whole system view of control. It is different from ‘system complexity’ in that it relates to the controllability aspects – a highly complex system can be very easy to control, and likewise, an apparently simple system can be very difficult to control and so the two things have to be treated independently. System Complexity is about the entities in a system; control complexity is all about the interactions between those entities. Control mechanisms may be formal or informal, explicit or tacit, planned or emergent.

Synonyms, Antonyms and Equivalent Meanings: negative feedback, positive feedback, feed-forward, missing-feedback, bottom-up, top-down, algorithm, self-re-enforcing, self- sustaining, automatic, input, output, integral, proportional, differential, response, inertia, lag, communication, interaction, sense/respond, unmanageable, command-and-control, first- principles, butterfly-effect, emergent, coupled, (in)dependent variable, unintended side- effects, transient, liminal, reaction, aftermath, after-effect, instructions, procedures, Plan- Do-Study-Act, continuous improvement, growth-mindset, Commander’s intent, ‘leading from the front’, ‘backseat drivers’, MBO, Management-by-Walking-Around, hands-on, laissez-faire, self-organising, discontinuity, grapevine, hearsay, rumour, gossip, word-of- mouth, dictat, AI, OODA, learning-organisation, ‘if we always do what we’ve always done…’, unexpected outcomes, unpredictable, oscillation, damping, fluctuation, band-aid, temporary-fix, interim solution, trial-and-error, optimal, sweet-spot, in-tune, in-the-pocket, empathy, ‘no-one is as smart as everyone’, hive-mentality, ‘singing from the same hymn sheet’, disobey, defy, go against, flout, contravene, infringe, overstep, transgress, violate, fail to comply with, micro-management, resist, oppose, fly in the face of, disregard, ignore.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

4, 23, 25, 32, 37

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

25, 37, 10, 7, 2, 19, 13, 24, 40, 15, 6, 12

List of Principles relevant to each specific worsening parameter:

31. Parameter We Want to Improve – Tension/Stress

Meaning: Tensions and stresses at either an organisational or personal level – both of which use very similar strategies to achieve win-win outcomes. Tension is the outcome of an external influence that is in conflict with the perceptions, beliefs or behaviour of the recipient. Stress is interpreted here as a more severe version of tension that occurs when the conflict with the external influence passes beyond a threshold level. While not necessarily meaning stress in its medical sense, the interpretation here is that the conflict has forced the organisation or person out of its comfort zone. At the other end of the spectrum, the absence of tension or stress can also be the source of problems. This parameter covers all points on the spectrum. The parameter is grouped separately from the ’intangibles’ cluster of parameters since the intention here is to focus on the tangible as opposed to emotional manifestations of tension and stress.

Synonyms, Antonyms and Equivalent Meanings: pressure, morale, crisis, crisis- management, constructed crisis, lack-of-motivation, comfort-zone, dispute, illness, medical symptoms, sick-leave, absenteeism, bullying, aggression, harassment, discrimination, exploitation, coercion, force, compulsion, constraint, duress, oppression, enforcement, insistence, unreasonable, demand, goading, pestering, provocation, anger, toxic, fear, nagging, harrying, badgering, intimidation, arm-twisting, persuasion, adversity, strain, unrelenting, dysfunction, overbearing, over-work, 110%, overload, ruinous, pernicious, overwhelm, deluge, swamp, inundate, discord, ‘them-and-us’, threat, trouble, war-footing, ‘attacked from all sides’, bombarded, smother, ‘between a rock and a hard place’, hostility, futile, trauma, anxiety, passive-aggressive behaviour, ‘arm-twisting’, nit-picking, blackmail, ‘trying to squeeze a quart into a pint pot’, apprehension, ‘calm before the storm’, ‘in-the- zone’, high-performing teams, synergy effects, ‘sum-greater-than-the-parts’.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

12, 23, 32, 36

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

13, 24, 2, 25, 7, 10, 19, 35, 1, 23, 8, 32

List of Principles relevant to each specific worsening parameter:

Notes:

Tension and stress problems often appear to occur during disruptive times and hence interpretation and use of Inventive Principles 36, Phase Transition, is always worth considering in such circumstances.

32. Parameter We Want to Improve – Stability/Resilience

Meaning: The integrity of a system; the relationship of a system's constituent elements. The ability of a system to cope with de-stabilising influences, whether internal or external, incremental or discontinuous, real or imaginary. The parameter can be applied at the macro (whole-system) or micro (individual) level. In these chaotic times of ever more rapid change in the world, too much stability can be as big a problem as insufficient stability. The parameter includes both ends of this spectrum.

Synonyms, Antonyms and Equivalent Meanings: vulnerability, robustness, fragile, anti- fragile, inertia, damping, chaos, edge-of-chaos, responsiveness, ability to recover, linear- range, non-linear change, disruption, consistency, predictability, tolerance, limits, extremes, boundaries, ‘point-of-no-return’, stress-test, firewall, self-correcting, self-compensating, ‘bounce-back’, contingency plan, worst-case scenario, Doomsday scenario, ‘weather the storm’, ‘batten down the hatches’, safety-margin, Blue-Team/Red-Team, war-chest, emergency fund, ‘living beyond our means’, ‘fall-three-times-stand-up-four’, indestructible, unbreakable, immortal, fatal-blow, sucker-punch, future-proof, bullet-proof, rally, re-group, unstable, precarious, vulnerable, disruption/Innovator’s Dilemma, ‘only-the-paranoid- survive’, oscillation, bifurcation, blockade, siege-mentality, hostage-to-fortune, first-mover- advantage, fast-follower, easy-to-break, cliff-edge, tightrope-walk, defensive maneuver, ‘form the wagons into a circle’, defenseless, unprotected, unarmed, guard-down, helpless, impotent, wide-open.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

12, 25, 36

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

25, 35, 19, 13, 36, 24, 10, 1, 34, 7, 9, 32, 2, 23

List of Principles relevant to each specific worsening parameter:

Notes:

Stability problems often appear to occur during disruptive times and hence interpretation of Inventive Principles 36, Phase Transition, is often particularly relevant.

33. Parameter We Want to Improve – Autonomy

Meaning: one of the four core intangible drivers of human behaviour (ABC-M). Autonomy is all about our innate desire to be in control and have control over our destiny and whatever situation we might find ourselves in at a given moment in time. Commonly, in a workplace setting, hierarchical structures mean that most people towards the bottom of the hierarchy are almost by definition not in control. At least tangibly. Being one of the core emotional drivers, even though a person may not tangibly be in control of their situation, the emotional drive will usually dominate.

Synonyms, Antonyms and Equivalent Meanings: control, authority, self-governance, independence, choice, self-rule, king-(of-the-castle), ruler-(of-the-roost), top-of-the-pile, sovereignty, self-determination, master-of-one’s-own-destiny, freedom, autarchy, free-will, volition, self-sufficient, individualism, ego, id, cog-in-the-wheel, slave, serf, vassal, servant, flunkey, lackey, upstairs-downstairs, hanger-on, follower, hireling, minion, underling, silent- majority, overlord, dictator, ruler, boss, supervisor, superior, leader, manager, jurisdiction, sway, power, programmable, permission, consent, sanction, licence, dispensation, assent, acquiesce, (seal-of)-approval, endorse, blessing, acceptance, allow, tolerate, sufferance, empowerment, freedom, liberty (Moist)-Robot, automaton, authority, command, dominance, domination, hegemony, jurisdiction, dominion.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

23, 25, 36

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

13, 23, 35, 10, 2, 24, 19, 15, 17, 7, 1, 25, 3

List of Principles relevant to each specific worsening parameter:

34. Parameter We Want to Improve – Belonging

Meaning: second of the four core intangible drivers of human behaviour (ABC-M). Belonging is all about our innate desire to be part of something and wanting others to want us to be with them. It is about the bonds that come only through being part of a community. The Belonging drive is coloured by a parallel desire to be both a valued member of the tribe and also be respected by the tribe. Some tribes are ‘cooler’ or ‘better’ than other ones, and so we typically aspire to be accepted into tribes that are at the ‘top of the hierarchy. When we become ill we often cease to be a member of our preferred tribe (the tribe of ‘healthy people’) and instead find ourselves in the less glamorous tribe of sick people. All men are born equal, but some are more equal than others.

Synonyms, Antonyms and Equivalent Meanings: tribe, collective, union, association, friend, family, home, kin, twin, friendship, cohort, neighbour, partner, ally, enemy, peer, pack, horde, throng, mob, herd, crew, swarm, multitude, mass, body, troop, cluster, team, team-player, compatriot, outsider, insider, bond, community, lagom, camaraderie, brothers- in-arms, blood-brothers, gang, clan, cool, aspire, faithful, congregation, church, reliable, cherish, passion, ‘go-to’-person, black-sheep, prodigal, couple, marriage, divorce, dislocation, sacrifice, compromise, join, inclusive, exclusive, exclude, clique, black-ball, conjoint, contiguous, peas-in-a-pod, equals, doppelganger, equality, equity, BFF, nemesis, foe, adversary, away, opponent, antagonist, combatant, challenger, border, refugee, immigrant, in-crowd, coterie, inner-circle, inner-sanctum, Mafia, affiliation, bloc, cabal, cahoots, cartel.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

7, 12, 23, 36

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

13, 23, 25, 2, 24, 7, 19, 35, 17, 10, 15, 21

List of Principles relevant to each specific worsening parameter:

35. Parameter We Want to Improve – Competence

Meaning: third of the four core intangible drivers of human behaviour (ABC-M). Competence is all about our innate desire to feel and be competent at whatever we set our minds to. Competence has a special relationship with learning – the main time when we’re almost inevitably in a situation in which we are ‘incompetent’. The incompetence triggers learning, which in turn – if we do it right – generates new competences. The trick is creating just sufficient ‘incompetence’ to do the job: too much and we shy away and often become defensive. Lack-of-competence has a role in everyone’s life, but it is typically best experienced either alone or with an equivalent group of novices.

Synonyms, Antonyms and Equivalent Meanings: smart, intellectual, subject-matter- expert, thought-leader, guru, master, teacher, learned, tutor, scholar, sage, counsellor, mentor, guiding light, craftsman, ingenuity, credibility, reputation, sensei, Black-Belt, star, gold-star, cream-of-the-crop, leading-light, cognoscente, ace, adept, artist, authority, governor, capacity, proficiency, accomplishment, adeptness, adroitness, knowledge, wisdom, common-sense, Hausverstand, skill, prowess, mastery, resourceful, faculties, talent, bent, aptitude, artistry, virtuosity, certified, qualified, trained, certificate, connoisseur, crackerjack, dab-hand, fiend, geek, nerd, hacker, specialist, generalist, improvise, professional, amateur, novice, naïve, unsophisticated, artless, ingenuous, inexperienced, guileless, childlike, dewy-eyed, starry-eyed, wide-eyed, beginner, apprentice, learner, neophyte, newcomer, raw-recruit, new-boy/girl, newbie, initiate, fledgling, tyro, (village-

)idiot, dunce, clown, fool, oaf, remedial, smug, out-of-their-depth, sink-or-swim, stranded, lost, firefight(er), saviour, rescuer.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

10, 23, 32, 36

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

24, 25, 23, 13, 2, 7, 35, 21, 1, 10, 26, 17

36. Parameter We Want to Improve – Sense Of Progress

Meaning: According to several researchers (hitting a pinnacle in Reference 36), the most important factor in ensuring change programmes are successful is creating and maintaining a ‘sense of progress’. When people feel that they are heading in the right direction, the tendency is to keep going. Creating a sense-of-progress involves designing projects with a chain of tangible and emotional progress feedback loops. If people don’t receive positive feedback about their progress within the next four weeks (some would say, two), the likelihood is that their morale and motivation to continue will begin to decline precipitously. It also involves setting an overall direction which is meaningful to the team and, if we wish to give ourselves the best chance of success, consistent with the Ideal Final Result evolutionary end-point defined by TRIZ.

Synonyms, Antonyms and Equivalent Meanings: advance, proceed, press-on, headway, gain-ground, further, extend, forward, accelerate, boost, onward-and-upward, short-cut, headway, hard-yards, baby-steps, two-steps-forward-one-step-back, tipping- point, pivot-point, traction, encourage, scouting-party, advance-guard, coasting, cruising, meander, crawl, snakes-and-ladders, Hype-Cycle (Reference 37), Blue Ocean, plain- sailing, open-waters, flying-start, relay, standing-on-the-shoulders-of-giants, going-around- in-circles, chasing-shadows, chasing-our-tails, stuck-in-the-mud, random-walk, shackles, backwards, limbo, diversion, worm-hole, idle, dead-end, glacial, ossified, cul-de-sac, suspended-animation, chain-gang, standstill, dead, paralysed, stationary, immobile, free- fall, tail-spin, discourage, Sisyphean, stagnate, retrogress.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

10, 23, 32, 36

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

24, 7, 13, 2, 28, 15, 1, 10, 26, 35, 17, 3

37. Parameter We Want to Improve – Catalysts/Nourishers (Positive Intangibles)

Meaning: One of the two ‘catch-all’ parameters in the ‘Intangibles’ cluster, this one focusing on the positive, and its neighbor, Parameter 38, focusing on the negatives. The whole of the Intangibles cluster is still quite new and the relative lack of case study and exemplar contradiction-solving illustrations in the public domain knowledge arena limits the level of granularity of the parameters we’ve been able to include in the book. This parameter clusters together all of the positive intangibles where there has not been sufficient data to make a separate parameter. As time progresses, and the amount of available illustrations grows it is likely that as the amount pertaining to a given emotion reaches a critical mass, it will be removed from this general parameter and receive its own individual entry. All that said, we have been very surprised over the years of gathering the thousands of illustrations that have fed into this Parameter that, given the breadth of different positive emotions, the spectrum of Inventive Principles used to resolve the conflicts relating to those different emotions has been remarkably consistent. We are happy to say, therefore, that the ranked lists of Inventive Principles present in the following table are statistically significant – the first named Principle in the list is first because a large proportion of case studies show evidence of that strategy being used to derive a breakthrough solution. There are a number of different taxonomies of human emotions we could have used to define the scope of the things we include in this parameter, the one we eventually decided upon was the one by Ortony and Turner (Reference 38).

Synonyms, Antonyms and Equivalent Meanings: love, affection, adoration, fondness, liking, attraction, caring, tenderness, compassion, sentimentality, lust/sexual desire, desire, passion, infatuation, longing, joy, cheerfulness, amusement, bliss, gaiety, glee, jolliness, joviality, joy, delight, enjoyment, gladness, happiness, jubilation, elation, satisfaction, ecstasy, euphoria, zest, enthusiasm, zeal, excitement, thrill, exhilaration, contentment, pleasure, pride, triumph, optimism, eagerness, hope, enthrallment, rapture, relief, surprise, amazement, astonishment, Hygge, glass-half-full, affection, doting, fondness, warmth, benevolence, gusto, joie-de-vivre, schadenfreude, hunky-dory, gobsmacked, savour, recognize, affirm.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

10, 24, 36

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

24, 25, 13, 2, 1, 40, 7, 10, 19, 21, 15, 22

38. Parameter We Want to Improve – Inhibitors (Negative Intangibles)

Meaning: Second of the two ‘catch-all’ parameters in the ‘Intangibles’ cluster, this one focusing on the negative, and its neighbor, Parameter 37, focusing on the positives. The whole of the Intangibles cluster is still quite new and the relative lack of case study and exemplar contradiction-solving illustrations in the public domain knowledge arena limits the level of granularity of the parameters we’ve been able to include in the book. This parameter clusters together all of the negative intangibles where there has not been sufficient data to make a separate parameter. As time progresses, and the amount of available illustrations grows it is likely that as the amount pertaining to a given emotion reaches a critical mass, it will be removed from this general parameter and receive its own individual entry. All that said, we have been very surprised over the years of gathering the thousands of illustrations that have fed into this Parameter that, given the breadth of different positive emotions, the spectrum of Inventive Principles used to resolve the conflicts relating to those different emotions has been remarkably consistent. We are happy to say, therefore, that the ranked lists of Inventive Principles present in the following table are statistically significant – the first named Principle in the list is first because a large proportion of case studies show evidence of that strategy being used to derive a breakthrough solution. There are a number of different taxonomies of human emotions we could have used to define the scope of the things we include in this parameter, the one we eventually decided upon was the one by Ortony and Turner (Reference 38).

Synonyms, Antonyms and Equivalent Meanings: anger, irritability, aggravation, agitation, annoyance, grouchy, grumpy, crosspatch, exasperation, frustration, rage, anger, outrage, fury, wrath, hostility, ferocity, bitterness, hatred, scorn, spite, vengefulness, dislike, resentment, disgust, revulsion, contempt, loathing, envy, jealousy, torment, sadness, suffering, agony, anguish, hurt, sadness, depression, despair, gloom, glumness, unhappiness, grief, sorrow, woe, misery, melancholy, disappointment, displeasure, dismay, shame, guilt, regret, remorse, neglect, alienation, defeatism, embarrassment, dejection, homesick, humiliation, insecurity, insult, isolation, pity, fear, horror, alarm, shock, fright, horror, terror, panic, hysteria, mortification, nervousness, anxiety, suspense, uneasiness, apprehension, worry, distress, dread, glass-half-empty, ill-starred, dishearten, dispirit, demoralize, despondent, downhearted, dampen, lose heart, put off, unnerve, daunt, intimidate, cow, unman, crush, deflate, let down, disconsolate, fed up, dejected, downcast, crestfallen, dismayed, low-spirited, unenthusiastic, cold feet, overwhelmed.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

22, 23, 32, 36

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

24, 7, 23, 13, 40, 10, 1, 25, 3, 19, 32, 17, 15, 2

39. Parameter We Want to Improve – Trust

Meaning: In the strict sense of the word, trust has two distinct parts, character and competence, in that, for example, we might have great admiration for our best friend, but nevertheless wouldn’t trust them to land an A380. The ‘competence’ part of the story is covered in Parameter 35, and thus leaves this one to focus on the ‘character’ side of the story. As detailed in what is probably the defining state of the art, ‘The Speed Of Trust’ (Reference 39), trust is a fundamental aspect of any enterprise involving more than one human being (i.e. all of them). We might have complete faith in a person’s ability to perform a task, but still not offer them a position because we do not have the requisite emotional connection to their character, integrity or intent.

Synonyms, Antonyms and Equivalent Meanings: character, integrity, intent, caring, transparent, honest, openness, fairness, authenticity, uprightness, probity, rectitude, honour, honourableness, upstandingness, good-character, principle(s), ethics, morals, righteousness, morality, moral strength, moral fibre, nobility, high-mindedness, right- mindedness, noble-mindedness, virtue, decency, scrupulousness, sincerity, truthfulness, trustworthiness, kind, kind-hearted, warm-hearted, soft-hearted, tender, feeling; concerned, attentive, thoughtful, solicitous, responsible, considerate, benign, humane, good-natured, fortitude, spine, backbone, toughness, resolve, will-power, grit, guts, gutsiness, gumption, bottle, spineless, cold, weak, weak-willed, weak-kneed, feeble, spiritless, soft, ineffectual, inadequate, irresolute, indecisive; cowardly, timid, timorous, fearful, faint-hearted, pusillanimous, craven, submissive, unmanly, namby-pamby, lily-livered, chicken-hearted, limp-wristed, afraid of one's shadow, wimp, sissy, sissified, chicken, yellow, yellow-bellied, gutless, pathetic, candy-assed, chickenshit.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

12, 23, 32, 36

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

24, 13, 7, 19, 32, 40, 23, 12, 9, 2, 25, 36, 1

40. Parameter We Want to Improve – Engagement

Meaning: In a business context, engagement means being fully occupied or having your full attention. If we're busy or involved with something, we're engaged in it. Picking up from the original meaning of the word as people who have committed to getting married, the word's origin, the French word engagier, means ‘to pledge’. This interpretation remain relevant in a work context: when we’re engaged in an activity, we have effectively pledged our full attention to that activity. The importance of highly engaged employees is evidenced by the effort enterprises expend on measuring it. In recent years, the consistent message seems to be that a significant majority of employees are not engaged, or ‘actively disengaged’ from their work, suggesting an enormous efficiency improvement opportunity if the problem can be solved. Psychological understanding of the engagement phenomenon is still not well understood. One of the seminal texts on engagement in the workplace can be found in Reference 40.

Synonyms, Antonyms and Equivalent Meanings: commitment, participation, involvement, taking-part, embrace, locked-in, attached, attentive, eyes-front, focused, concentrated, absorbed, engrossed, fascinated, enthusiastic, enthralled, enrapt, rapt, earnest, intense, zest, studious, steadfast, occupied, preoccupied, wrapped-up, alert, watchful, observant, determined, resolved, single-minded, obsessive, obsessed, fanatical, fixated, asleep (at the wheel), boredom, dis-engaged, ennui, lack of interest, lack of concern, apathy, disinterest, languor, sluggishness, accidie, malaise, wearisome, world-weary, frustration, dissatisfaction, restless, restive, tedium, tedious, dullness, monotony, repetitive, flatness, same-old-same-old, routine, humdrum, dreary, dismal, trite, tiresome, lifeless, vapid, colourless, featureless, banality, insipid, bland, pointless, senseless, futile, hopeless, fruitless, useless, needless, wasted, in-vain, unavailing, aimless, idle, purposeless, worthless, valueless, unproductive, unprofitable, absurd, insane, nonsensical, irrelevant, fatuous, inane, risible, brainless, mindless, asinine, moronic.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

6, 12, 25, 38

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

13, 7, 24, 32, 10, 1, 25, 26, 19, 2, 12, 15, 3, 40, 23

41. Parameter We Want to Improve – Meaning

Meaning: fourth of the four core intangible drivers of human behaviour (ABC-M). Meaning is all about man’s innate desire to devote their lives to ‘making a difference’, live a life of ‘purpose’ and contribute in whatever way they can to the advance of themselves, their community and the world at large. If there is a hierarchy in the four intangibles, Meaning sits at the top of it. Many researchers have claimed that ‘happiness’ (or the pursuit thereof) is life’s primary purpose, but those (Reference 41, 42 for example) that point the compass in the heading of Meaning seem to be gaining the upper-hand today. The problem with including a ‘Meaning’ parameter in any kind of business or work-place discussion in many organisations, is that much of the work and many of the activities found therein are on most counts meaningless. Or worse, destroys meaning. The decision to include it aligns with the growing view that now is the time in human history where we have the best opportunity ever to start designing-out meaninglessness and enabling work that delivers genuine Meaning to all stakeholders.

Synonyms, Antonyms and Equivalent Meanings: purpose, calling, identity, congruence, spirituality, essence, being, validity, worth, consequence, usefulness, significance, point, reason-for-living, conviction, resolve, self-actualisation, sacred, devotional, ecstasy, soulful, joie-de-vivre, enlightenment, secret-of-life, grail, insight, Eureka-moment, ‘flow’-state (Reference 43), Zen-like, futile, pointless, aimless, empty, hollow, vain, meaningless, purposeless, motiveless, valueless, useless, worthless, trivial, trifling, existential, nihilism, vacuous, unimportant, insignificant, inconsequential, insubstantial, nugatory, fruitless, profitless, barren, unavailing, impotent, void, abyss, Sisyphean, pyrrhic, soul-destroying, frivolous, superficial, shallow, unthinking, empty-headed, feather-brained, mind-numbing, foolish, silly.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

7, 23, 24

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

13, 7, 25, 24, 10, 23, 2, 5, 19, 1, 32, 40

42. Parameter We Want to Improve – Ability To Measure

Meaning: How difficult is it to make measurements on an object, process, human-related emotions or system. Complex, costly, time-consuming, labour-consuming inspection or analysis operations. Increasing cost of measuring to a satisfactory quality level. Also includes ease of inspection. An analysis of innovation attempt failures in the business environment (Reference 44) reveals that a majority fail because either no measurement of important parameters has been made, the measurements have been made incorrectly, or they have been interpreted incorrectly. The Big Data Analytics industry may be said at this point in time to be largely dysfunctional due to a preponderance of situations where analytics scientists have been guilty of measuring what is easy rather than what is important. We spun out the PanSensic ‘science of reading between the lines’ company (Reference 45) as a means of trying to rectify this situation, allowing enterprises for the first time to have an ability to measure whatever they believe is important to the future success of their operations.

Synonyms, Antonyms and Equivalent Meanings: access, location, integrity, visibility, absolute, relative, dashboard, quantify, qualitative, evaluate, assess, appraise, gauge, weigh-up, pros-and-cons, right-size, invisible, ‘read-between-the-lines’, ‘digging-for-gold’, ‘needle-in-a-haystack’, insight, objective, defendable, incontrovertible, evidence-based, indisputable, incontestable, undeniable, irrefutable, unquestionable, indubitable, beyond- doubt, inarguable, certain, unequivocal, unambiguous, unmistakable, sure, definite, definitive, proven, proof-positive, positive-ID, decisive, conclusive, clarity, clear-cut, manifest, evident, self-evident, staring-one-in-the-face, demonstrable, observable, vital- signs, pulse, fingerprint, palpable, uncontroversial, acknowledged, marked, pronounced, emphatic, categorical, compelling, gut-feel, convincing, clinching, airtight, watertight, covert, under-the-radar, flying-blind, hidden, concealed, undetectable, indiscernible, indistinguishable, inconspicuous, unnoticeable, imperceptible, qualm, skepticism.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

4, 6, 32, 40

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

13, 10, 26, 35, 7, 24, 4, 40, 2, 1, 28, 25

43. Parameter We Want to Improve – Measurement Accuracy

Meaning: Degree of precision or accuracy. The closeness of a measured value to an actual value of a property of a system. Measurement error. This parameter is complementary to 42, ‘Ability To Measure’: that Parameter is all about being able to make a measurement. In this ‘Accuracy’ Parameter the emphasis shifts to situations in which we have already established a way of making the desired measurement, but now wish to evolve it and make it better.

Synonyms, Antonyms and Equivalent Meanings: precision, tolerance, go/no-go, error, correctness, exactness, rightness, trueness, rigour, perfection, validity, unambiguousness, authority, reliability, repeatability, consistency, evenness, steadiness, stability, constancy, regularity, uniformity, equilibrium, unity, orderliness, dependability, resolution, standard- deviation, transient, rate-of-change, unerring, faultless, errorless, error-free, mean, median, mode, bias, direct/indirect, traceable, significant-figures, F-score, chi-squared, amelioration, strict, meticulous, first-order, second-order, commensurate, equivalent, relative, correlated, analogous, drift, false-reading, false-positive, diverge, deviate, gist, crux, essence, quintessence, epitome, heads-up, quantum, uncertainty, aggregate, summation, composite, integral, proportional, differential, exponential, non-linear, gross, net, discrepancy, divergent, convergent, disparity, difference, ‘nail-on-the-head’, ‘on-the- money’, bullseye, crosshairs, bearing.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

4, 25, 37

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

25, 24, 10, 7, 2, 15, 40, 37, 4, 35, 9, 17, 19

44. Parameter We Want to Improve – Harmful Factors Affecting System

Meaning: This parameter is designed as a miscellaneous catch-all for any form of action or phenomenon in or around a system that manifests itself as a tangible harmful effect on something in the system. All the issues, in other words, where the public domain does not contain sufficient case study information to make each of the elements contained herein to become a parameter in their own right. As the situation evolves, it is highly likely that some of the elements contained here will eventually become specific Parameters in their own right.

Synonyms, Antonyms and Equivalent Meanings: undesirable effect, security, threats, allegations, compatibility, contamination, poison, safety, noise, dispute, competitive threat, (hostile) take-over, debt, legal challenge, change in the law, law-suit, job-cut, redundancy, act-of-God, natural disaster, black swan, down-time, down-turn, recession, quarantine, siege, espionage, breach of confidentiality, bad-press, necessary-evil, bear-the-brunt, hammer-blow, kiss-of-death, tragedy, prohibition notice, mis-alignment, political-shift, political correctness, shift in social norms, mis-management, malfeasance, sexism, racism, (and many other ‘isms’), hazard, injury, repetitive strain, accidents, ostracized.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

12, 22

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

35, 2, 24, 13, 10, 7, 25, 15, 5, 9, 3, 28, 40

45. Parameter We Want to Improve – System Generated Harmful Factors

Meaning: This parameter is designed as a miscellaneous catch-all for any form of tangible inefficiency or negative effect internal to or immediately around a system that manifests itself as a harmful effect on something around the system. All the issues, in other words, where the public domain does not contain sufficient case study information to make each of the elements contained herein to become a parameter in their own right. As the situation evolves, it is highly likely that some of the elements contained here will eventually become specific Parameters in their own right.

Synonyms, Antonyms and Equivalent Meanings: environmental damage, adverse social consequence, adverse political consequence, adverse effects on health, addiction, litter, emissions, noise, pollution, contamination, safety hazard, short-term, long-term, side-effect, consequence, precedent, incitement, chaos, riot, co-lateral damage, dispute, black-spot, negligence, lobbying/market-distortion, air quality law, water quality law, waste management law, environmental cleanup law, natural resources law, species protection, water resources law, mining law, forestry law, fisheries law, game law, triple-bottom-line, triple-top-line, ecological footprint, Earth’s carrying capacity, Fair-Share, trickle-down, have/have-not gap, squeezed-middle, accountability (lack of), cycle of dependency, fake news, scapegoating, immigration, genocide, refugee crisis, forced migration, rust-belt, poverty, de-industrialisation, ghost-town, division, polarization, ghettoization, extremism, moral panic.

Inventive Principles that should always be considered for problems where we wish to improve this parameter:

2, 10, 12, 22

Averaged list of other Principles that should be considered where we wish to improve this parameter (decreasing order of frequency):

35, 10, 13, 2, 24, 7, 15, 25, 5, 34, 40

List of Principles relevant to each specific worsening parameter:

40 Inventive (Business) Principles With Examples

Following systematic analysis of close to, now, over six million successful inventive solutions extracted from all areas of human endeavour – from the sciences, the arts, politics, engineering and business – researchers have discovered just 40 inventive strategies for challenging and eliminating conflicts and contradictions. These 40 inventive strategies or ‘Inventive Principles’ present a comprehensive series of solution triggers. They are in fact ‘signposts’ suggesting the directions in which successful – no compromise – solutions may be found.

The simplest way of using the Principles is in a brainstorming context. This is where we seek to make connections between a problem situation and the solution directions being suggested by each Principle. Whereas a traditional brainstorming session will begin to falter after a relatively short period, the Principles allow us to re-invigorate the idea generation process by simply moving on to look at a different Principle when we are no longer generating new ideas from the current one. It is frequently the case that brainstorming sessions managed using the Principles in this sequential manner can still be generating powerful new ideas after several hours. The traditional brainstorming process is largely random in the way that it works. One of the big underlying ideas behind the form and structure of the Inventive Principles is that they allow a complete solution space to be explored systematically and completely.

It is worth noting here that in order to ensure that the solution space coverage is as comprehensive as possible, there is some overlap between some of the Principles. To some users, this can be a little frustrating. To them, we say two things; 1) the overlap is intentional and, on the evidence of too many actual problem sessions to count anymore, ultimately beneficial, and 2) if you examine the next Principle in your sequence and think to yourself ‘hey, I already saw this one’, either try to force yourself to use the new one to generate more ideas, or simply move on to the next Principle.

Evidence from a growing user base clearly shows a benefit in becoming familiar with all of the Principles (you will begin to see them everywhere you look after a while). You might like to add your own examples to the database presented here.

Each Principle is presented with three levels of detail. At the most generic level is the basic title description of the Principle – ‘segmentation’ or ‘the other way around’. At the next level of detail – presented as A, B, C, etc – are more descriptive definitions of how a given Principle has previously been interpreted by other problem solvers. And at the finest level of detail are a series of examples of each of the Principles and A, B, C sub-principles.

For this business-specific Principles list, we’ve also taken the decision to include examples taken from Sun Tzu’s classic, ‘Art Of War’. Not so much because of an interest in matters military, but because when we look at the so-called 36 Strategies in Sun Tzu’s work, they all relate to contradiction solving in some way. There are perhaps no more extreme cases of conflict than military conflict, and what the 36 Strategies gave the world are a series of heuristics for winning without fighting. Sun Tzu didn’t quite have a strategy to cover each of the 40 Principles, but, as you will shortly see, he came closer than most. We made the decision in this book to re-sequence the 36 Strategies to fit the taxonomy of the 40 Principles. Readers interested in exploring the Strategies in the Sun Tzu sequence may wish to check out Issue 37 (April 2005) of the Systematic Innovation ezine.

Principle 1. Segmentation

A Divide an entity, process or system into separate parts or sections.

◦ Divide an organisation into different product centres.

◦ Autonomous profit centres.

◦ Use a work breakdown structure for a large project.

◦ Franchise outlets

◦ Dunbar number

◦ Kano Diagram – Excitement, Performance, and Threshold product attribute parameters.

◦ Marketing segmentation by demographics, sociographics, psychographics, lifestyles, etc (creation of ‘micro-niches’)

◦ Segmentation of ‘idea management’ process into Fertilization, Seeding, and Incubation phases

◦ Strength/Weakness/Opportunity/Threat (SWOT) analysis

◦ Openly Repair The Walkway, Secretly March To Chencang (Sun Tzu Strategem #8): Against a seasoned and wary opponent a feint will prove ineffective. Instead make a direct attack in an expected direction and manner to gain attention. When the enemy forces are focused on this attack, begin a second attack from a different and unexpected direction

B Make a system easy to put together and take apart.

◦ Use of temporary workers on short-term projects

◦ Flexible Manufacturing Systems

◦ Flexible pensions

◦ Modular offices/’hot-desking’

◦ Container shipment

C Increase the degree of fragmentation or segmentation.

◦ ‘Segment of one’ advertising – mass customization

◦ Virtual office/remote working

◦ Phone apps

◦ ‘Creative Segmentation’ – ‘high performance small car’, ‘easy to use D-SLR’, ‘cordless phone charger’

Principle 2. Taking Out

(also known as: Extraction, Separation)

(frequently used interpretations: silo-breaking, de-couple)

A Where a system provides several functions of which one or more are not required (and may be harmful) at certain conditions, design the system so that they can be taken out.

◦ Cloud computing – just pay for what you use

◦ USP advertising

◦ Break down silo’s

B Physically separate different elements of an object or system.

◦ Lure The Tiger Down The Mountain (Sun Tzu Strategem #15): Never directly attack a well entrenched opponent, instead lure him away from his stronghold, separating him from his sources of strength

◦ Expanding cities often deliberately build new infrastructure (e.g. airports) separate from the main areas in order to stimulate growth to occur in the resulting gap

◦ Skunkworks – separate production and research activities

◦ Marks & Spencer’s ‘Simply Food’ – take the convenience food out of the back of the high street store and put it where people actually want to buy it

C Temporally separate different elements of an object or system.

◦ Sacrifice The Plum Tree In Place Of The Peach (Sun Tzu Strategem #11): There are circumstances in which you must sacrifice short-term objectives in order to gain the long-term goal. This is the scapegoat strategy whereby someone else suffers the consequences so that the rest do not

◦ Just-in-Time inventory management

◦ Peak-period pricing models

D Separate different elements of an object or system based on different condition-based requirements.

◦ Breakdown barriers between departments (Point No.9 of Deming’s Fourteen Points).

◦ Eliminate exhortations (Point No.10 of Deming’s Fourteen Points)

◦ Eliminate targets (Point No.11 of Deming’s Fourteen Points).

◦ Drive Out Fear (Point No.8 of Deming’s Fourteen Points)

◦ ‘Separate the PEOPLE from the PROBLEM’ (‘Getting To Yes’ ).

◦ Separate between a person’s role and their employment – e.g. if the role disappears; employment is still guaranteed

◦ Smart software learns user preferences and filters out non-useful information.

◦ Semantic processors used to extract ‘knowledge’ from text

◦ To Catch The Bandits, First Capture Their Leader (Sun Tzu Strategem #18): If people are allied to their leader only by money or threats, aim at the leader. If he falls the people will disperse (if they are allied they will fight for vengeance). To kill a poisonous snake, you must cut off the head

Principle 3. Local Quality

A Where an entity, process or system is uniform or homogenous, make it non-uniform.

◦ Moves away from rigid salary structures/job grading.

◦ Skill/personality matching in project teams

◦ ‘safe space’

◦ Panic Room

◦ Fractional ownership

◦ Project ‘war-room’

◦ Franchise fast food outlets have local dishes in addition to normal product range.

◦ Casual (‘dress-down’) days.

◦ Introduce ‘Corporate Jester’ (e.g. British Airways) as a method of encouraging ‘out of the box’ thinking.

◦ Red team/Blue team proposal preparation structures

◦ ‘Quiet’ work areas/meeting areas/etc.

◦ Besiege Wei To Rescue Zhao (Sun Tzu Strategem #2): When the enemy is too strong to attack directly, attack something he holds dear. Know that he cannot be superior in all things, that somewhere there is a gap in the armour, a weakness that can be attacked instead.

◦ Clamour In The East, Attack In The West (Sun Tzu Strategem #6): An enemy will re-inforce in places where he expects an attack to take place; in so doing a part of his army is neutralized if you then choose to attack in an unexpected place

◦ Steal The Firewood From Under The Pot (Sun Tzu Strategem #19): When faced with an enemy too powerful to engage directly, first weaken him by attacking vulnerable areas, undermining his foundations, or attacking his sources of power

B Change things around the system (e.g. the environment)) from uniform to non-uniform.

◦ ‘Empowerment’ of individuals

◦ Have each employee's workplace customized to individual ergonomic and psychological needs.

◦ Working hours phased to accommodate people working on international, shifted time-zone projects

◦ Using coffee-breaks for informal (non-uniform) communication

◦ Customizable software

C Enable each part of a system to function in locally optimised conditions.

◦ Hot-desking

◦ Differential teacher pay scales to attract staff to shortage subjects

◦ Staggered-start/finish working hours for different teams or parts of enterprise.

D Enable each part of a system or object to carry out different (possibly directly opposite) useful functions.

◦ Organisational division by function rather than product.

◦ Staff specialists in centres of excellence

◦ Hire local people to acquire cultural knowledge of local customers

◦ ‘Kids areas’ in restaurants, etc

Principle 4. Asymmetry

(frequently used interpretations: ‘freemium’, skew, bias, ‘gorilla in the room’, signal/noise ratio)

A Where an entity, process or system is symmetrical or contains lines of symmetry, introduce asymmetries.

◦ (Proportionately) more ‘Plan’ or more ‘Study’ in the Deming PDSA cycle

◦ Skewed normal distributions.

◦ Budget for different departments individually rather than using a constant percentage increase or reduction for all departments

◦ More ‘customer’ in the customer-supplier relationship

B Change an entity or system to suit external asymmetries.

◦ Freemium business model

◦ Different school class-sizes according to subject

◦ Seasonal/weather-based pricing of tourist attractions

◦ Crowd-sourcing allowing customers to vary the size of their stake

C If an entity or system is already asymmetrical, increase the asymmetry in other dimensions.

◦ 360º appraisals

◦ More equitable 2-way dialogue between management and workers

◦ Shift away from calendar-influenced sales bias (e.g. shift from annual to bi-annual car registration dates (to reduce August sales peak), greetings card companies, etc.)

◦ Honda’s 4M – ‘man maximum, machine minimum’ product design philosophy.

◦ Bigger customer focus groups/Internet focus groups

◦ On-line, web-cam shopping – ‘one store serves the world’

◦ Collaboration with ‘complementor’ organisations when competing for business with other directly competitive companies

Principle 5. Merging

(frequently used interpretations: turnkey, multi-media)

A Physically join or merge identical or related entities, operations or functions.

◦ Cell-based Manufacture

◦ Toyota JIT/’Lean manufacture’

◦ Common-interest groups

◦ Multi-screen cinemas

◦ Shopping malls

◦ Banks, etc offer customers a full range of financial service packages – current, savings, mortgage, pension, etc.

◦ Merge with companies offering related/synergistic products (‘complementors’)

◦ The ‘Joiner Triangle’ – Quality/Scientific Approach/All-One-Team

◦ ‘Young engineers have ideas, old engineers have bad experiences’ Japanese saying

B Join or merge objects, operations or functions so that they act together in time.

◦ Eli Goldratt’s Theory of Constraints

◦ Enlisting customer and supplier help in designing the product (Boeing 777 ‘Working Together Teams’)

◦ Multi-media presentations

◦ Movie/book/soundtrack/Internet/merchandise tie-ins

◦ Package holidays

◦ Call centres

◦ The Strategy Of Combining Tactics (Sun Tzu Strategem #35): Launch multiple, simultaneous attacks; Plant a succession of traps so that if one doesn’t work there are still others for the enemy to fall into; Do not repeat past tactics

Principle 6. Universality

(frequently used interpretations: social media, Autonomy-Belonging-Competence-Meaning)

A Make an entity, process or system able to perform multiple functions; eliminating the need for other systems.

◦ Multi-skilling of work-force

◦ ‘One-stop shopping’ – supermarkets sell insurance, banking services, fuel, newspapers, etc.

◦ Single bank-account that automatically optimizes funds in savings, current, etc.

◦ Rapid Reaction Forces in the military – cross-trained, equipment versatility, etc

◦ Internet/Intranet allows improved communication across companies, project teams – everybody has access to all relevant information.

B Make use of universal behavioural traits

◦ Universal intangibles: ‘Autonomy-Belonging-Competence-Meaning’ (ABC-M)

◦ Offer individuals Share options to increase sense of belonging to the mission of the organisation

◦ Semco – managerial staff set their own salaries, shopfloor workers set their own productivity targets, part of change agent’s job is to eliminate need for his/her job

◦ People make decisions for two reasons: the good reason and the real reason.

C Adopt or facilitate a universal standard.

◦ Open-source software

◦ Universal plugs/sockets

◦ Transferable degree credits

◦ ATMs work for multiple banks

◦ Industry standards – e.g. communication protocols – HTML/Internet

Principle 7. "Nested Doll"

(frequently used interpretations: higher purpose, natural-hierarchies)

A Put one entity or system inside another.

◦ Store-in-store

◦ Place members of your team inside other teams, to increase ‘walk a mile in my shoes’ empathy

◦ ‘Visit Gemba’ – ‘live’ with the customer

◦ Unite teams by connecting them to a ‘higher purpose’

B Put several entities or systems inside others.

◦ Profit centers inside an organisation

◦ Embed stories into company culture

◦ Six-Thinking Hats inside project teams – promoting different types of thinking at different times/occasions

C Allow one entity or system to pass through an appropriate gap or pause in another.

◦ Expose traditionally inward facing job-holders to external events/customers (e.g. engineers shadow marketing people during customer visits)

◦ Door sensors count customers into and out of a store/office, etc (use data for market profiling, etc)

◦ Internet ‘Navigator’ companies

D Hierarchically nest at multiple levels.

◦ Four levels of knowledge – 1) Basic Skills, 2) Know How, 3) Process Management, 4 Strategic Vision – contained in effective company (e.g. Sony) training schemes

◦ Hierarchical organisation structures

◦ Make use of natural hierarchies (e.g. formal/informal networks)

Principle 8. Counter-Balance

A When an entity or system deviates from a desired path, introduce protocols or forces that provide a re-stabilising effect.

◦ In a merger of two companies, one ‘lifts’ the other with whatever its stronger features are (distribution system, marketing, methods, capital, etc)

◦ Companies increase flagging sales by making connections with other rising products (e.g. movie tie-ins)

◦ Make use of natural human propensity to help a person in need.

◦ Attaching the word ‘new’ is the most powerful way of enhancing the sales of fast moving consumer goods

B Re-stabilise an entity or system using interactions with global/macro-scale phenomena

◦ A small company is ‘lifted’ by use of an external transportation network to the level of the larger companies

◦ Political parties boost poll ratings by attaching themselves to popular causes

◦ Attach product/service marketing to customer and business driving forces (Megatrends – aging population, desire for flexibility, simplicity, etc)

◦ In bad economic times, there are always winners – affiliate with, or shift business to capitalize on ‘inevitable winner’ opportunities.

Principle 9. Preliminary Anti-Action

(frequently used interpretation: constructed crisis)

A Where an action contains both harmful and useful effects, precede the action with opposite or anti-actions to reduce or eliminate the harmful effects.

◦ When making a public announcement, exaggerate the bad news such that when the eventual story emerges it feels less bad than had been anticipated.

◦ Use formal risk assessment methods to quantify risk and identify mitigation actions before and during a project – subversion analysis (‘how could we destroy this system?)

◦ Encourage short, effective meetings by removing the chairs

◦ Customer trials/segmented launch of (high risk) new products (e.g. film companies film several endings to a movie and trial with different audiences before finalising selection)

◦ Asking to be ‘paid to play’ during a competitive bid when you are the new player and the customer is looking to get the incumbent to reduce price

◦ Use of voluntary redundancy/pay-cuts/short-time working/job-sharing as alternatives to down-sizing

◦ Telling someone that they can’t have something is often a very effective way of making them want it more

◦ Fool The Emperor To Cross The Sea (Sun Tzu Strategem #1): A wary opponent is unlikely to fall into usual traps so he must be made to relax – therefore carry on as though nothing is afoot

◦ Feign Madness, But Keep Your Balance (Sun Tzu Strategem #27): Hide behind the mask of a fool, drunk or madman in order to create confusion about your intensions, luring your enemy to drop his guard and thus making him easier to attack

◦ Exchange The Role Of The Guest For That Of Host (Sun Tzu Strategem #30): When the enemy is strong, deflect him from within under the guise of co-operation, surrender or a peace treaty, then strike when their guard is relaxed

B Introduce stresses in an entity to oppose known harmful stresses later on.

◦ Epson product development engineers spend time as sales and then service staff before they are allowed to work on product development activities

◦ Use (difficult) mystery-shopper to test the patience/ability of staff

◦ Team-building tasks are done before the real project starts (for example the team spends one week on a special seminar, so that they can learn to work together)

◦ Negotiate upfront stage payments in a long term contract

Principle 10. Preliminary Action

(frequently used interpretations: prime-the-pump, pre-x)

A Introduce a useful action into an entity, process or system (either fully or partially) before it is needed.

◦ Project pre-planning

◦ ‘80% of a successful production is in the casting’ Lindsay Anderson

◦ Perform non-critical path tasks early (where circumstances permit)

◦ ‘Off-the-shelf’/’ready-made’/’pre-packaged’ solutions

◦ Pre-suasion – the process of arranging for recipients to be receptive to a message before they encounter it (Robert Cialdini)

◦ Create buzz about a new product by ‘leaking’ news ahead of formal launch

◦ Await The Exhausted Enemy At Your Ease (Sun Tzu Strategem #4): It is an advantage to choose the time and place for battle - in this way you know when and where the battle will take place, while your enemy does not. Encourage your enemy to expend his energy in futile quests while you conserve your strength. When he is exhausted and confused, you attack with energy and purpose; whoever is first in the field and awaits the enemy will be fresh.

◦ Beat The Grass To Startle The Snake (Sun Tzu Strategem #13): When you cannot detect the plans of an opponent, launch a direct but brief attack in order to observe their reactions

B Pre-arrange entities or systems such that they can come into action at the most convenient time and place.

◦ Kanban arrangements in a Just-In-Time factory

◦ Cell-based manufacture

◦ Begin with ‘S’ in the PDSA cycle

◦ Publish an agenda before meetings

◦ Dealer-fit car accessories – CD player, alloy wheels, air-con, etc.

◦ ‘If I had 8 hours to chop down a tree, I’d spend 6 hours sharpening my axe’ Abraham Lincoln.

C Re-sequence a series of actions according to changing needs and requirements.

◦ Observe The Fire On The Opposite Shore (Sun Tzu Strategem #9): Delay entering the field of battle until all the other players have become exhausted fighting amongst themselves. Then go in full strength and pick up the pieces

◦ Benetton ‘retarded differentiation’ – clothing is knitted before it is dyed; colour only applied when the season’s popular colours emerge.

◦ Discovery-Driven Planning

◦ Distributed systems – local depots, etc

Principle 11. Beforehand Cushioning

A. introduce emergency backups to compensate for the potentially low reliability of an entity (‘belt and braces’).

• Contingency planning and definition of ‘fall-back solutions’

• Secured loan

• Directors and Officers Insurance Policy

• Double/triple indemnity insurance

• Establish a worst-case, fall-back position prior to negotiation - ‘Best Alternative to a Negotiated Agreement’

• Construct a hedge using stocks, exchange-traded funds, insurance, forward contracts, swaps, options, etc.

• Back up computer data

• Anti-virus/anti-malware software

• Put clauses in contracts requiring arbitration/mediation to avoid litigation

• If All Else Fails, Retreat (Sun Tzu Strategem #36): If all else is lost, escape – unlike surrender or compromise, escape is not defeat

Principle 12. Remove Tension

(frequently used interpretations: customer frustration, Vital Friends, ‘skin-in-the-game’)

A. Where harmful tensions may exist, create conditions to compensate, reduce or eliminate them

• Make ‘horizontal’ career changes to broaden skills

• ‘Don’t Push Rivers’ – make natural flows work for you rather than against

• Map customer frustrations in order to identify frustration-relieving innovation opportunities

• ‘Vital Friends’

• Double-entry book-keeping

• Team members distribute their own merit award money (rather than often divisive distribution methods employed by management)

• Force-Field Analysis – group discussion of the phrase ‘forces push in various directions’ – teambuilding/problem-solving technique.

• Use (carefully timed) laughter to de-fuse tension at start of a presentation

• (In)formal coalitions

• Beware of the Peter Principle – ‘Every employee tends to rise to his/her level of incompetence

• Single-union agreements

• ‘No-fault’ termination clauses written into contracts

• Embrace ‘tough love’ honesty (Ray Dalio, Bridgewater)

• ‘Communication is and should be hellfire and sparks, as well as sweetness and light’ Aman Vivian Rakoff

Principle 13. 'The Other Way Around'

(frequently used interpretations: open-source, permission based marketing, ‘Uberization’)

A Invert the entity, process or system.

◦ Bring the mountain to Mohammed, instead of bringing Mohammed to the mountain.

◦ Focus on the unknowns rather than the knowns

◦ Work on the most difficult problems first, rather than the easy ones.

◦ Permission-based marketing

◦ Pull rather than push business models

◦ Expansion instead of contraction during recession.

◦ Benchmark against the worst instead of (or at least as well as) the best

◦ Blame the process not the person

◦ Transform the Maintenance department into the ‘Resilience’ department and get them to eliminate maintenance

◦ ‘I used to think that anyone doing anything weird was weird. I suddenly realised that anyone doing anything weird wasn’t weird at all, and it was the people saying they were weird that were weird’ Paul McCartney.

B Invert the action(s) used to solve the problem.

◦ Increase workload rather than continuing to reduce it (when point of minimum propensity to error has been passed)

◦ The Streisand effect — trying to suppress or censor information has the habit of drawing attention to it

◦ Loot A Burning House (Sun Tzu Strategem #5): When an enemy is beset by internal conflicts, when disease and famine ravage the population, when corruption and crime are rampant, then he will be unable to deal with an outside threat. This is the time to attack.

◦ The Strategy Of Open City Gates (Sun Tzu Strategem #32): In a desperate situation, often the only recourse is to do something completely unexpected; e.g. act casually in the face of an enemy that knows they are in a dominant position

C Make movable entities fixed, and fixed entities movable.

◦ Home-shopping

◦ Home banking

◦ Park-and-ride schemes in busy cities

◦ Mobile car service – mechanic comes to you rather than you going to garage

◦ Mobile library

◦ Hot-desking

◦ Drive-through café

◦ Don’t make changes just because they are fashionable management fads

D Turn the entity, system or process 'upside down'.

◦ Cash-till assistant is the most important part of a retail organisation

◦ Computer help lines were often originally set up with relatively no-technical staff at the front-end, directing calls to progressively more technically able staff the more complicated the problem is. Latest logic suggests reversing this trend – i.e. place the most qualified staff as first point of contact (e.g. IBM)

◦ ‘Ready, Fire, Aim’ – Tom Peters

◦ Mercedes Benz vision changed from ‘the best or nothing’ to ‘the best for our customers’ – i.e. shift from internal to externally focused vision statement.

◦ The Peter Pyramid

◦ Corporate ‘unlearning’ – acquiring the ability to forget about the past where appropriate

◦ ‘Ours is the age that is proud of machines that think and suspicious of men who try to’ H Mumford-Jones

◦ Russian government pays inventors for patent applications/West makes the inventor pay to apply.

◦ Chairman of company spends time in the complaints department answering customer complaints

◦ ‘Nothing fails like success’

◦ ‘We don’t stop playing because we grow old, we grow old because we stop playing’

◦ ‘When you reach the top, that’s when the climb begins’ Michael Caine

Principle 14. Rotate/Loop

(frequently used interpretations: vicious/virtuous cycle, re-x, OODA Loop (Observe-Orient- Decide-Act), PDSA, diverge-converge cycles, sense-respond)

A Rotate the entity, process or system.

◦ Take the shortest path to the customer – around the organisation rather than point- to-point through the bureaucracy

◦ Levi Strauss' IS Department's organizational chart resembles a solar system, with the names of 20 managers appearing once on a large circle-and in many cases, also on one of four smaller circles intersecting the large one. The small circles represent action groups focusing on specific tasks, including customer service and business systems.

◦ Rotate leadership in a project as different stages of the cycle are passed.

◦ Break downward cycles/’vicious-cycles’

◦ Establish ‘virtuous circles’ and engineer to become self-reinforcing

◦ ‘Form the wagons into a circle’ John Wayne

B Introduce loops and (open or closed) cycles.

◦ Fail-fast, fail-forward

◦ Circular work cells

◦ Ring-road/roundabout

◦ Case-based reasoning

◦ Peer-to-peer learning/mentoring systems

◦ After-Action-Review

◦ 360degree appraisal

◦ 3-Step Habit Loop – cue-routine-reward (Charles Duhigg, The Power Of Habit)

◦ Recognise that the Deming PDSA cycle is circular and that the ‘Act’ stage feeds into the next ‘Plan’ stage (e.g. project teams are often disbanded before any ‘lessons learned’ are recorded)

Principle 15. Dynamization

A Allow an entity or system to change to achieve optimal operation under different conditions.

◦ Empowerment

◦ ‘Customer Response Teams’

◦ Continuous Process Improvement

◦ Rapid Reaction Force

◦ Flexible shift patterns

◦ Swatch design proliferation – design for specific market niches

◦ ‘In today’s turbulent business environment, there are no hard fast conclusions – only transitions’

◦ ‘Change is the only constant’

◦ Seize The Opportunity To Lead A Sheep Away (Sun Tzu Strategem #12): While carrying out your plans be flexible enough to take advantage of any opportunity that presents itself, however small, and avail yourself of any profit, however slight; adapt plans to suit prevailing circumstances

B If an entity or system is rigid or inflexible, make it movable or adaptable.

◦ Work teams oriented to achieve same goal, but work at different rates on different objectives

◦ Flexible learning systems – students determine their own pace through the curriculum

◦ Peak-hour pricing models

◦ Soda vending machines where price varies according to ambient temperature

◦ Geographically or functionally independent business units

◦ Conglomerate structures

C Increase the amount of free motion.

◦ Web-cam based on-line shopping – customer is able to control and move cameras to point to different products in different parts of the store from his/her home computer

◦ ‘One in front’ supermarket queue management strategies – staff empowered to open more tills when queues begin to build

◦ Floating license subscription services

◦ Radiohead ‘In Rainbows’ album – customers decide how much they wish to pay for their copy

◦ ‘In a start-up company, you basically throw out all assumptions every three weeks.’ Scott McNealy

◦ Flexible organisation structure (chaocracy)

Principle 16. Partial Or Excessive Action

A If exactly the right amount of an action is hard to achieve, use 'slightly less' or 'slightly more' to reduce the problem.

◦ ‘If it ain’t broke, improve it anyway’ – Japanese process management philosophy.

◦ Use Pareto analysis to enable work to concentrate on the high return elements.

◦ Set stretch targets in the knowledge that achievement of less than the full amount is still well worth having

◦ Aim to ‘delight’ rather than ‘satisfy’ customers

◦ Restricted-calorie diet for longer, healthier life – forces body into ‘self-repair’ mode

◦ In gambling, ‘near misses’ increase affinity and propensity to continue playing

◦ Design deliberate overlap between the roles of managers in order to improve communications (commonly used Japanese strategy)

◦ ‘The most important numbers are the ones you’ll never know’ – W.E. Deming (i.e. is it possible to ever know what ‘100%’ means)

◦ Over-book flights, knowing that not all passengers will show up

◦ (Over-commit projects, knowing that there will be a percentage of unbooked time)

B If the exact solution can’t be achieved in one go, introduce a simple, second action to compensate for the discrepancy.

◦ Pour Guinness in two-stages – pour-settle-top-up

◦ Barber performs ‘rough’ cut followed by fine-trim at the end when hair has settled

◦ Minimum Viable Demonstration

◦ Artillery batteries use ranging shots

◦ Turf walkways around a new building and only introduce hard-standing paths after user-wear patterns have emerged.

Principle 17. Another Dimension

(frequently used interpretations: intangibles, triple-bottom-line accounting, unstructured data, ‘orbit-shifting’, Porter’s Five Forces)

A If an entity, process or system uses only one dimension, introduce other dimensions.

◦ Focus on the ‘between’ rather than the things

◦ Focus on the metaphors people use (better revealer of truth)

◦ Switch from being ‘pioneer’ to ‘fast-follower’ type innovation strategy

◦ Continuous appraisals (i.e. use of the time dimension)

◦ Multi-dimensional organisation hierarchy charts – 3D (e.g. to show ‘hard’ and ‘soft’ relationships), or 4D – to include an element of time (‘Buckyball Management’)

◦ Distributed responsibility and authority – e.g. Quality department advises on technical details and conducts audits, but everyone is responsible for quality. Ditto Safety Office.

◦ ‘When all else is equal – spec, price, schedule, etc - we buy from our friends. When all else is unequal, we still buy from our friends’

◦ Befriend A Distant Enemy To Attract One Nearby (Sun Tzu Strategem #23): To attack any objective, enlist the aid of those that are antithetical to your opponent (when you are the strongest in your field, your greatest threat comes from the second strongest; not the strongest in another field)

◦ Lure Your Enemy Onto The Roof, Then Take Away The Ladder (Sun Tzu Strategem #28): Using baits and deception, lure your enemy into treacherous terrain, then cut off his lines of communication and avenue of escape

B Use a stacking arrangement of entities instead of a single level arrangement.

◦ Organisational hierarchy

◦ Multi-stack storage systems use the height of a building, and save floorspace

◦ ‘Standing on the shoulders of giants…’

◦ ‘When two people meet, there are really six people present. There is each man as he sees himself, each man as he wants to be seen, and each man as he really is.’ Michael De Saintamo

C Re-orient the entity, process or system, lay it on its side.

◦ Horizontal (peer) communication

◦ Horizontally integrated manufacture

◦ Switch from vertical to horizontal (lateral) thinking – and vice-versa

◦ Shift from ‘line’ to ‘project’ management dominance in matrix organisation (and vice-versa – depending on prevailing market conditions)

◦ Shift from portrait to landscape report format

D Use a different attribute of a given entity, process or system.

◦ View your organisation from the outside – either directly or using consultants, etc.

◦ ‘Six Thinking Hats’ – different mindsets for different stages of a meeting

◦ ‘Six Action Shoes’

◦ Supermarkets increasingly sell fuel at a loss to attract customers into stores and make their profit there

◦ ‘A good manager doesn't try to eliminate conflict; he tries to keep it from wasting

◦ the energies of his people. If you're the boss and your people fight you openly when they think that you are wrong -- that's healthy’ Robert Townsend‘

◦ The things we fear most in organizations - fluctuations, disturbances, imbalances - are the primary sources of creativity’ Margaret J Wheatley.

◦ ‘You can’t teach an old dogma new tricks’ Dorothy Parker

◦ Hide Your Dagger Behind A Smile (Sun Tzu Strategem #10): Hide sinister intentions behind a façade of friendship and loyalty

E Change customer focus between performance, reliability, convenience, price.

◦ Kia seven-year guarantee made many car customers realise reliability was more importance than performance

◦ Enterprise car rental sells largely on convenience – with the hire car coming to the customer rather than making customer visit depot

◦ When music buyers get used to ‘free’ music, industry shifts focus of attention to concerts and VIP ‘meet and greet’ experiences.

Principle 18. Resonance

A Find and make use of the ‘resonant frequency’ of a person, entity, process or system.

◦ ‘I don’t think that you should ever manage anything that you don’t care passionately about’ D Coleman, VP & CFO Apple

◦ ‘He inspired in us the belief that we were working in a medium that was powerful enough to influence the world’ Lillian Gish on D.W.Griffiths

◦ Use strategic planning (policy deployment, hoshin Kanri) to select the right frequency and get the organisation resonating at that frequency to accomplish a breakthrough strategy

◦ ‘Kansei’ – Japanese term for resonance/one-ness between product and user

◦ The idea of ‘flow’ (being ‘in the zone’ or ‘in the groove’). The flow state is an optimal state of intrinsic motivation, where the person is fully immersed in what they are doing... Mihaly Csikszentmihalyi

B Make use of emotional ‘exciters’.

◦ Kano Model

◦ ‘Do you want to sell fizzy water the rest of your life or change the world?’ Steve Jobs attracting executives away from Coca-Cola

◦ Peer-to-peer marketing

◦ Comic Con type cos-play conventions tap into minority group affinities

Principle 19. Periodic Action

(frequently used interpretations: daily, weekly, monthly, quarterly, annual, tidal)

A Replace continuous actions with periodic or pulsating actions.

◦ Batch manufacture.

◦ ‘Lunchtime learning’ – 5/10 minute video/webinar education content

◦ Tidal traffic flow schemes ease transport into and out of busy areas

◦ Diverge-converge problem solving cycles

◦ Change team leadership periodically (e.g. the EU leadership is rotated on an annual basis between different countries)

◦ Introduce sabbaticals to refresh people’s points of view

◦ Create Something From Nothing (Sun Tzu Strategem #7): Use the same feint twice. Having reacted to the first and often the second feint as well, the enemy will be hesitant to react to a third feint. Therefore the third feint is the actual attack catching your enemy with his guard down

B If an action is already periodic, change the periodic magnitude or frequency to suit external requirements.

◦ Audit at irregular intervals

◦ Extraordinary General Meeting

◦ Use monthly or weekly feedback instead of annual reviews

◦ Flexible savings schemes which pay higher interest rates the fewer the number of withdrawals made

◦ Zara rapid collection updates (e.g. mid/quarter season)

Principle 20. Continuity of Useful Action

A Make all parts of an object or system work at full load or optimum efficiency, all the time.

◦ Run the bottleneck operations in a factory continuously, to reach the optimum overall pace. (from Theory of Constraints)

◦ Institute Constant Improvement (Point No.5 of Deming’s Fourteen Points)

◦ Continuous on-line monitoring of elevators by Otis who take on total maintenance responsibility

◦ Aravind Eye Hospital where surgeons perform so many operations compared to ‘normal’ cataract hospitals that not only are they more efficient, but also benefit from much broader experience gained much faster

◦ 24 hour car service operation – evening pick-up, return of serviced car by breakfast the following morning (garage perspective)

◦ ‘Life-long learning’

◦ Streams of consciousness

◦ ‘The power of a waterfall is nothing but a lot of drips working together’

◦ ‘The more I practice, the luckier I get’ Gary Player

◦ Permanent domain-expertise based (e.g.TRIZ-) teams work on TRIZ projects all the time rather than sporadic use of tools on occasional projects

B Eliminate all idle or non-productive actions or work.

◦ Multi-skilling to enable working in bottleneck functions to improve workflow

◦ ‘Follow-the-sun’ globally distributed software engineering workflows

◦ Conduct training during pauses in work

◦ Shut The Door To Catch The Thief (Sun Tzu Strategem #22): If you have the chance to completely defeat or capture an enemy, then do so. To allow an enemy to escape plants the seeds for future revenge

Principle 21. Skipping

(also known as: Hurrying, Rushing Through)

(frequently used interpretations: hackathon, minimum-viable-product, minimum-viable- demonstration, speed-date, kick-start, burning-platform)

A. Conduct an action at very high speed to eliminate harmful side-effects.

• ‘Incrementalism is innovation’s worst enemy’ Negreponte, MIT Media Lab

• Flash-mob

• Kickstarter

• ‘Ready, Fire, Aim’

• ‘Short, sharp shock’ to help re-educate criminals rather than long-sentences

• Bootcamp

• ‘Don’t be afraid to take a big step if one is indicated. You can’t cross a chasm in two small jumps’ David Lloyd George

• If you want to break a lump of toffee, hit it with a hammer, don’t bend it slowly

• ‘Fail Fast; Learn Fast’/‘Fail Fast, Fail Forward’

• ‘Fast Cycle – Full Participation’ – method of involving the whole organisation simultaneously and rapidly in a major change, such as a re-organisation

• Get through painful processes quickly (e.g. firing someone)

• Rapid prototyping

• ‘If you want to succeed, double your failure rate’ JR Watson, IBM founder

Principle 22. "Blessing in Disguise"

(also known as: ‘Turn Lemons Into Lemonade’, Turn Harm Into Benefit, ‘Two Wrongs Make A Right’)

(frequently used interpretation: anti-fragile)

A Transform harmful objects or actions (particularly, the environment or surroundings) so that they deliver a positive effect.

◦ Recast an attack on you as an attack on the problem.

◦ ‘Dumb things we do around here’ initiative – encourage people to poke fun at dumb things, then empower them to eliminate them

◦ No news is good news

◦ Making a fuss over customers who have experienced a problem with your goods/services/etc, tends to re-enforce their overall positive feel about you – to a level greater than that where no problem had occurred.

◦ Turn contract negotiations into win-win situations – see a drive to reduce price as an opportunity to negotiate longer term or ‘last-look’ options

◦ ‘Provocations’ method of encouraging new ideas

◦ Cutting the head off Hydra causes two heads to grow (antifragile)

◦ ‘The Extra Mile will have no traffic jams.’ Unknown

◦ The Strategy Of Injuring Yourself (Sun Tzu Strategem #34): Feigning injury means you are perceived as less of a threat, and so your enemy relaxes his guard. Or; ingratiate yourself with your enemy by attributing a feigned injury to a mutual enemy

B Add a second harmful entity or action to neutralize or eliminate the effects of an existing harmful entity or action.

◦ Eliminate fear of change by introducing fear of competition

◦ Put a ‘problem’ person on an assignment in another area where he/she can do well and not be a problem to the original group

◦ Loss-leader strategy for increasing sales

◦ Keep traffic out of cities by introducing cheap ‘park and ride’ and expensive downtown parking charges

◦ Make potentially polluting industries place flow intakes downstream of flow outlets on a river

◦ Stop the progress of a forest fire by burning the path ahead of the fire

◦ Vaccines increase a child’s resistance to disease by exposing them to small levels of pathogens (e.g. the reason asthma is on the rise is because the air in our houses is now often ‘too clean’)

C Increase a harmful factor to such a level that it is no longer causes harm.

◦ Reduce resourcing levels to such an extent that new ways of doing the job have to be discovered

◦ Put out an oil fire by explosion

◦ Restrict supply of goods to create scarcity value (e.g. some sports car manufacturers seek to maintain a multiple year waiting list on vehicles giving them a certain cachet that they would not otherwise have)

D Make use of ‘waste’ resources.

◦ Re-hire retired workers for jobs where their experience is needed

◦ Loan out temporarily under-utilised workers to other organisations (load-capacity balancing across companies – e.g. footballers – win-win situation; the player stays match fit, the loaner saves wages, the loanee fills skill shortage)

◦ ‘Industrial eco-systems’

◦ ‘Brown-field’ developments

◦ Body Shop re-cycles used containers brought back by customers – helps promote corporate green image

◦ Re-cycle all packaging material

◦ Borrow A Corpse To Raise The Spirit (Sun Tzu Strategem #14): Symbols, myths, institutions and philosophies have moral and emotional power; appropriate this power to achieve your higher strategic goals and objectives. Take an institution or technology that has been forgotten or discarded and appropriate it for your own purpose.

Principle 23. Feedback

A Introduce feedback to improve a process or action.

◦ Statistical Process Control (SPC) - Measurements are used to decide when to modify a process

◦ Budgets - Measurements are used to decide when to modify a process.

◦ Enlist customers in the design process.

◦ ‘Extranets’

◦ Loyalty cards

◦ Customer surveys/customer seminars, etc

◦ ‘Active Transition Management’ as a way of controlling product development process between research, development and production phases.

◦ Electronic bulletin boards

◦ ‘What you measure is what you get’ Joe Juran

B If feedback is already used, make it adaptable to variations in operating needs or conditions.

◦ Change a management measure from budget variance to customer satisfaction.

◦ Expose designers as well as marketers to customers

◦ Multi-Criteria Decision Analysis (valid ‘apples and oranges’ comparisons).

◦ Toshiba medical systems division split into Design, Engineering and Manufacture sectors. As a product is being developed, key personnel and leadership physically move from one sector to another to actively manage transitions between product development stages.

◦ ‘Open the kimono’ – everything out in the open – communication

◦ ‘Supravision’ rather than ‘supervision’

◦ ‘Co-evolutionary marketing’ – e.g. Amazon.com invites readers to write on-line book reviews; other readers often prefer these views to professional reviewer evaluations, therefore people visit the site more often

◦ Motorola ‘open dissent’ policy – employees fill in a minority report to senior management when ideas they consider valuable are unsupported by colleagues and immediate superiors

◦ Use of ‘half-life’ as a measure of improvement (e.g. time taken to half product development time) to encourage large-scale thinking

C Introduce intelligent, ‘learning’ feedback.

◦ Artificial Intelligence

◦ Voice recognition algorithms that evolve and improve the more they listen to a user

◦ Product recommendation engines, ‘other customers who bought this, also enjoyed this’… the more the system is used, the higher the quality of the recommendations

◦ Intelligent vehicle algorithms recognize and adapt to fickle driver behavior to maintain vehicle performance or economy or reliability

D Introduce (predictive) feed-forward.

◦ Netflix algorithms predict future series that will be successful (e.g. House of Cards) before the initial script is written

◦ Predictive analytics

◦ Predictive text anticipates next words based on the context of other words in the message and the first letters typed

Principle 24. 'Intermediary'

(frequently used interpretations: common enemy, Trojan-Horse, buffer, mystery-shopper, proxy, trusted-third-party, complementor, placebo, drum-buffer-rope)

A Introduce an intermediary between entities, processes, systems or actions.

◦ Use of impartial body during difficult negotiation (e.g. ACAS)

◦ Unite people by finding a ‘common enemy’

◦ Trusted ‘third party’

◦ Attaching organisation to a charitable cause

◦ ‘Po’ (provocative operator) – a place between ‘yes’ and ‘no’, construct devised by Edward DeBono to help avoid premature discarding of ideas

◦ Sub-contract non-core business (e.g. cleaning services, transport)

◦ Franchisee acts as intermediary between corporate vision and customer

◦ Travel agent (NB can also mean removal of intermediary – e.g. direct selling).

◦ UPS distribution system using core sorting centre.

◦ KLM ‘feeder’ airline concept – short flights from Germany, England pull passengers away from national airlines in order that they fly long distances using Holland as a hub

◦ ‘Video Plus’ – programme video using simple codes to represent channels, dates and times

◦ ‘Cuckoo Investments’

◦ Kill With A Borrowed Sword (Sun Tzu Strategem #3): When you do not have the means to attack your enemy directly, then attack using the strength of another. Trick an ally into attacking him, bribe an official to turn traitor, or use the enemy's own strength against him.

◦ Point At The Mulberry But Curse The Locust Tree (Sun Tzu Strategem #26): Point at one to scold another - criticize an enemy indirectly (using analogy and innuendo), getting your point across without direct confrontation

B Introduce a temporary intermediary which disappears or can be easily removed after it has completed its function.

◦ Introduction of specialist trouble-shooting or fire-fighting teams

◦ Hire consultant.

◦ Cloud storage

◦ Use bridging loan arrangements to help cashflow

◦ Subcontract occasional services – accounts, cleaning, transport, etc.

Principle 25. Self-Service

(frequently used interpretation: machine learning algorithm, autonomous-x, autopoietic)

A Enable an entity, process or system to organise, manage, change or transform itself.

◦ Quality Circles

◦ Self-help groups

◦ Stigmergy

◦ Machine-learning algorithms

◦ Radiohead ‘In Rainbows’ album – allow customers to decide for themselves how much they wish to pay for it.

◦ Brand image circularity – Harvard Business School produces bright people; these people enhance the School’s reputation; hence lots of people apply; hence they only take on very bright people; bright people in equals bright people out; and so the circle re-enforces itself.

◦ ‘Cookies’ on the Internet gather data useful for future marketing activities, while performing a useful service for the ‘surfer’

◦ Bar-codes in supermarkets provide instant pricing information, but the system also gathers information to assist future marketing decisions

B Make use of unused or under-utilised resources within or outside the current system.

◦ Edward DeBono’s suggestion to Ford UK that they buy National Car Parks and then only let Ford cars into the parking lots – i.e. motorists buying a Ford are also buying a parking place in every city

◦ GPS signals from mobile phones provide data to enable active SatNav traffic congestion algorithms

◦ Make use of local universities/students to provide brainpower to work on difficult challenges in a win-win arrangement where students gain the opportunity to work on real industry problems

◦ Charities make use of under-utilised creative problem-solving resources within large corporations in a win-win arrangement where problem-solvers get to exercise their skills on new problem types

Principle 26. Copying

(frequently used interpretations: safe-to-fail experiment, mock-up, scenario-planning)

A Use simple and inexpensive copies in place of expensive, possibly vulnerable entities or systems.

◦ Bench-marking.

◦ ‘Safe to Fail’ experiments

◦ Appreciative Inquiry

◦ Use narrative stories to increase affinity with an organisation, product or service

◦ Failure Modes and Effects Analysis (FMEA)

◦ Rapid prototyping (e.g. stereo-lithography)

◦ Problem-based learning/case-based reasoning

◦ Scan rare, historic books, documents, etc so they are accessible to all and the original remains protected

◦ Lascaux II – reproduction of Lascaux cave paintings which is open to visitors

◦ Toss Out A Brick To Attract Jade (Sun Tzu Strategem #17): Prepare a trap then lure the enemy into it using bait – e.g. using an illusion of opportunity for gain, wealth, power, sex

◦ Shed Your Skin Like The Golden Cicada (Sun Tzu Strategem #21): When in danger of defeat and your only chance is to escape, create an illusion. When retreating, leave something behind that will divert or slow the progress of the enemy

B Replace an entity, or action with a virtual copy.

◦ Virtual product service manuals

◦ Cryptocurrencies

◦ Tele-presence

◦ Flight simulator reduces pilot training costs

◦ Numerical simulation – operational analysis (virtual war-gaming, virtual business development, strategic planning modeling)

◦ Video-conferencing instead of physical travel

◦ Use a central electronic database instead of paper records in cases where multiple users would benefit from simultaneous access to data – e.g. medical records, customer data, engineering drawings, etc

◦ Keep your personal calendar on a web-site so you (and others?) can access it from any computer, and it can’t get lost

◦ Novell ‘iHome’ system gives users an Internet accessible version of their computer hard-drive.

C Model a system using a simulation or virtual reality.

◦ Lego Digital Designer – build a virtual Lego model, then purchase the physical bricks

◦ Immersion virtual reality

◦ Augmented reality

◦ ‘CAVE’ automatic virtual environment where projectors are directed to between three and six of the walls of a room-sized cube

Principle 27. Cheap Short-Living

(frequently used interpretations: canary-in-a-coalmine, smokescreen, feint, straw-man, Fail- Fast-Fail-Forward, distraction)

A. Replace an expensive entity or system with a multitude of inexpensive, short-life replacements.

• Use disposable paper objects to avoid the cost of cleaning and storing durable objects. Plastic cups in motels, disposable diapers, many kinds of medical supplies.

• Pop-up shop/street-food/restaurant/etc

• Throw-away cameras/mobile-phones, etc

• Chaff/smokescreen

• ‘Disposable organisation structures’ in rapidly changing markets – i.e. little point in massively optimising structures in e-commerce businesses which are still in a state of rapid evolution.

• Swatch ‘renewed impulse’ buying - ‘Change clothes? Change Swatch’.

• ‘Cardboard police’ – 2D policemen or police cars over freeway bridges used as a means of slowing down traffic

• Tie Silk Blossoms To The Dead Tree (Sun Tzu Strategem #29): Through artifice and disguise, make something of no value appear valuable; make something dangerous appear safe; make something useful appear useless

Principle 28. Emotional Fields

A Introduce an emotional (‘experience’) element to an entity, process or system.

◦ Empathy Map Canvas

◦ Use a disorienting dilemma as the first step toward provoking (adult) learning

◦ ‘Land Rover Experience’ – opportunity for drivers to embark on challenging off-road adventure

◦ Research participants asked to give an impromptu three-minute talk scored higher on persuasiveness and confidence if they first said to themselves “I am excited,” in comparison with those who said “I am anxious” or explicitly tried to calm down

◦ Get customers excited about the product by giving them ownership of the change

◦ Get employees excited about the future of the company by using full involvement strategic planning, or stock options, or… etc.

◦ ‘A fired-up team wins games even if it’s not the best team. A fired-up company can achieve the same result’

◦ Trouble The Water To Catch The Fish (Sun Tzu Strategem #20): Before engaging an enemy, create confusion to weaken perceptions and judgment; do something strange or unusual to disrupt normal thinking patterns

B Replace or supplement an existing emotion with a means making use of another sense (optical, acoustic, taste, touch or smell).

◦ CEO of budget motel chain; ‘our goal is that when you turn out the lights and climb into bed, you think you are at the Hilton’

◦ Multi-media presentations

◦ Sensurround cinema

◦ Audio branding/corporate sound logo

◦ Learning by listening, seeing and doing

◦ Use of scents as a memory trigger

◦ Infrasonics – playing a musical instrument at frequencies too low to be heard to create a spine-tingling dimension to music or film soundtrack

◦ Supermarkets pump bakery odours around the store to help advertise bread products

◦ ‘The seeing of objects involves many sources of information beyond those meeting the eye when we look at an object. It generally involves knowledge of the object derived from previous experience, and this experience is not limited to vision but may include the other senses: touch, taste, smell, hearing, and perhaps also temperature or pain.’ R.L.Gregory

C Change from static to movable, fixed to variable, and/or from unstructured to structured emotions.

◦ Musical soundtrack triggers emotion changes at various points in hero’s journey

◦ Theme-park rides

◦ ‘Service choreography’/service orchestration

◦ ‘Earworm’, sometimes known as a brainworm, sticky music, stuck song syndrome, or Involuntary Musical Imagery (INMI) is a catchy piece of music that continually repeats through a person's mind after it is no longer playing

◦ Music that is ‘impossible not to dance to’

D Boost an emotional effect on one person by affecting another person, entity, process or system.

◦ ‘Friends and family’ promotions

◦ ‘What Would X Do?’ where X is an aspirational or admired character

◦ ‘Just like Grandma used to make’

◦ Fraternities and sororities

◦ Alumni associations

◦ Aspirational ethics

◦ ‘Emotional entrainment’ - the feeling of affective attunement with others during rituals, etc to increase the identification with a social group

Principle 29. Fluid

A. Make an object, process or system fluid in order to be able to rapidly conform to altering external conditions.

• ‘Water logic’ versus ‘rock logic’ – fluid, flowing, gradually building up logic versus permanent, hard-edged, rock-like alternatives

• Flexible (fluid) organisation structure versus old fixed hierarchical structures

• Liquid/fluid/floating assets

• Cashflow

• Fluid boundaries

• MBWA – Management By Walking Around

• ‘Float the company’/public float or free float - the portion of shares of a corporation that are in the hands of public investors as opposed to locked-in stock held by promoters, company officers, controlling-interest investors, or government

• Organisations traditionally viewed as ‘competitors’ may become collaborators on certain projects – this is happening increasingly in the aerospace industry, which now has a much more fluid approach to who works with whom.

Principle 30. Thin and Flexible

A Incorporate thin & flexible systems and structures.

◦ The thinnest film is a single molecule thick. Likewise, the thinnest organisation structure is one employee thick. Get faster customer service by having the single employee customer service agent have all the necessary data easily available, so the customer only deals with the single, flexible ‘shell’ of the organisation not the whole bulky volume.

◦ ‘De-layering’ within an organizational hierarchy

◦ ‘We like to delegate and leave people as free as possible, so we try to push management decisions down the line. We run Rolls-Royce with a very thin corporate structure’, Lord Tombs of Brailes, ex-Chairman of Rolls-Royce

◦ Razor-Thin Margin business model

◦ ‘Rip off the sticking plaster’

B Isolate an object, process or system from a potentially harmful environment using a flexible layer.

◦ Office workers in open areas can use flexible curtains to shut themselves off from the visual chaos of the open area when they need to concentrate rather than communicate

◦ Use ‘trade secret’ methods to separate company proprietary knowledge from general knowledge

◦ Patent ‘fence’

◦ Advance-guard/scouting-platoon operates ahead of the bulk of troops in order to provide forward look-out

◦ Hedge fund

◦ Umbrella Asset Trust

Principle 31. Holes

(frequently used interpretations: amnesty, time-out, cooling-off period)

A Introduce holes, pauses or gaps.

◦ Introduction of ‘breathing spaces’ into contracts

◦ Standstill period – time to allow unsuccessful bidders to challenge the decision before a contract is signed

◦ Non-compete clause

◦ Waiting period – time which a company making an IPO must be silent about it, so as not to inflate the value of the stock artificially

◦ Think of the customer-facing layers of a company as a porous membrane which filters information flow both into and out of the organisation

◦ Improve internal communications by creating Intranet accessible by all hierarchical layers; giving workers access to CEO and vice-versa.

◦ ‘Nature abhors a vacuum’ – deliberately eliminate certain roles in an organization as a way of exploring how the system will fill in the missing elements

◦ Government ‘leaks’ – used as a way of gauging public reaction to (usually) controversial issues

◦ To Catch Something, First Let It Go (Sun Tzu Strategem #16): Do not obstruct an army retreating home; if you besiege an army, you must leave an outlet; do not press an exhausted invader; do not corner an opponent as their only option is to fight for their lives

B Add something useful into the holes, pauses or gaps.

◦ Use mind-maps, self-patterning capabilities, etc to improve the information/ knowledge intake and filtering abilities of the brain

◦ Conduct maintenance/trial operations during down-time

◦ Media relations department turns spin-doctor and/or marketing feedback gatherer

◦ Lunchtime-learning/’brown-bag training’

◦ Power nap

C Use gaps between actions to perform different useful actions.

◦ Use travelling time to catch up on reading

◦ Perform maintenance work during vacations

◦ Introduce stimulating activities (external speakers, etc) during times of the week when work output is low – e.g. Friday afternoons

◦ Water-cooler conversation

◦ 24-hour car service operation – evening pick-up, return of serviced car by breakfast the following morning (customer perspective).

◦ ‘Hot-till’ing in supermarkets – staff do other tasks during quiet periods and move to tills when they see queues developing

Principle 32. Transparency

A Change the transparency or colour of an object, process or system, or its surroundings.

◦ Triple-bottom-line accounts

◦ Corporate Social Responsibility reporting

◦ Red/Blue proposal preparation teams

◦ Use of lighting effects to change mood in a room or office

◦ Six Thinking Hats

◦ Creation of ‘corporate colours’ – creating a strong brand image through use of bespoke colours – ‘BP green’, ‘British Telecom red’ phone boxes, ‘Ford blue’, etc

◦ Use colours to communicate state of alert (green, black, amber, red, etc)

◦ Security alert states – psychologically, people remember colours better than text

◦ Publish salary information and other sensitive information to increase trust (e.g. Norway publishes salaries of all citizens)

◦ ‘Radical Transparency’ increases rate-of-learning of organisation (Bridgewater)

B Vary the degree and areas of transparency according to prevailing circumstances.

◦ Reduce organization communications transparency during security breach

◦ Switchable transparency

◦ Create (anonymized) ‘whistle-blower’ communication channels

◦ Social media companies have established considerable amounts of information about an individual, and often walk a fine-line between how much they reveal of what they know versus how valuable their knowledge is to the individual… a general trend towards increasing transparency helps maintain trust

◦ Smoke-screen/mis-information to disguise confidential Design etc activities

Principle 33. Homogeneity

(frequently used interpretation: peer-to-peer)

A. Make interacting objects from the same constituents (or constituents with matching properties).

• Co-located project teams

• Peer-to-Peer (P2P) business model

• Common Interest Groups

• Use Congruence Model to assess and improve team dynamics

• Netflix ‘highly-aligned, loosely-coupled’ internal team protocol

• Use PanSensic psychometric tools to assess team alignment along multiple different axes

• Buddy-system (connect students to other students to help each other learn)

• Internal customers

• Recruit for values (as opposed to merely qualifications)

• Product branding/product families

• Boeing ‘Working Together Teams’ – bring customers and suppliers into the design loop.

• ‘Complementor’ organizations – ones that are not competing with yours, but which enable the creation of a win-win benefit – e.g. toothpaste and chewing-gum companies

• ‘Singing from the same hymn sheet’

• Common data transfer protocols between different organisations

• ‘The best way to make a silk purse from a sow’s ear is to begin with a silk sow. The same is true of money’ (Augustine’s Law #1)

Principle 34. Discarding and Recovering

A Make elements of a system that have fulfilled their functions disappear, or appear to disappear.

◦ Flexible, variable-sized project teams

◦ Load/capacity balance using contract labour

◦ Consultants

◦ Contract hire of specialised equipment/facilities, etc

◦ Bridging loan

◦ Corporate ‘unlearning’ – removal of redundant knowledge

◦ Borrow The Road To Conquer Guo (Sun Tzu Strategem #24): Borrow the resources of an ally to attack a common enemy. Once the enemy is defeated, turn on the now weakened ally and defeat them too (as they may consider doing the same to you)

B Restore consumable or degradable elements of a system during operation.

◦ Need to periodically re-energise continuous improvement initiatives (‘enthusiasm injections’)

◦ Bring in new players (and competition for places) to re-invigorate team

◦ Counteract the natural tendency for people to revert to their comfort-zone with periodic disruptions to the day-to-day order

◦ Life-long learning (where individuals are given responsibility for managing their own personal continuing education, ensuring skills remain up to date)

Principle 35. Parameter Changes

A Change from a physical to a virtual form.

◦ Virtual prototyping/numerical simulation

◦ eSports

◦ Tele-presence/distance-learning/webinar

◦ Virtual shopping

◦ e-Commerce/e-Business

◦ Telephone/online banking

◦ Electronic voting in elections

◦ Shift from film to digital cameras (invented by Kodak, but deemed too disruptive to their prevailing business)

◦ Replace The Beams With Rotten Timbers (Sun Tzu Strategem #25): Disrupt the enemy’s normal methods of operation, change the rules and habits they are used to following, thus taking away physical and moral foundations

B Change from a product to a service business model.

◦ Switch by Rolls-Royce from selling engines to ‘Power By The Hour’ & ‘Total Care’ leasing models (thus enabling a whole new generation of low-cost airlines)

◦ Otis Elevator doesn’t sell lifts and escalators, instead offering full service contracts guaranteeing safety and availability

◦ New ways of looking at the selling process - instead of selling carpets to its commercial and industrial customers, Interface offers what it calls the "Evergreen Lease." Customers no longer buy carpets or installation fees, they just pay a monthly service fee guaranteeing they will always have clean, attractive carpets

◦ Moves away from fixed clothing size partitions – e.g. ‘Personal Pairs’ - a customer at a participating store chooses which fabric he/she wants, then is measured. Those measurements are transmitted instantly to a Levi's plant in Tennessee where the data controls a laser cutter. The bar-coded pieces are stitched on the regular assembly line, and mailed directly to the customer.

◦ Switch from selling printer cartridges to selling ‘printing’

◦ Automotive industry is currently struggling with the (inevitable) shift from selling cars to selling ‘mobility’ – the recognition that customers decreasingly feel the need to own a product they won’t be using for 95% of its life

C Change from delivering one function to another.

◦ Pfizer’s Viagra was originally intended as a remedy for angina pectoris

◦ Start-up companies ‘pivot’ when they realize ‘Plan A’ business plan doesn’t resonate with paying customers

◦ The most legendary pivot in social media history is the transformation of Odeo into Twitter. Odeo began as a network where people could find and subscribe to podcasts, but the founders feared the company’s demise when iTunes entered the market. After giving the employees two weeks to come up with new ideas, the company decided to make a drastic change and run with the idea of a status- updating micro-blogging platform

◦ Starbucks started off in 1971 selling espresso makers and coffee beans

◦ 3M’s technology ‘periodic table’ allows the Company to combine multiple technologies to deliver a myriad range of new capabilities across a range of different functions

◦ Introduce intelligence into on-line catalogues (e.g. first generation catalogues were replicas of previous paper versions, latest generation incorporate search engines, expert systems, etc)

Principle 36. Discontinuity

(frequently used interpretations: Adoption Cycle – Pioneer-Early-Late-Laggard; Hero’s Journey stages – Call-Refusal-Mentor-Threshold-Tests-Cave-Ordeal-Reward-Return- Resurrection-Elixir; Hype Cycle – Trigger-‘Peak of Inflated Expectations’-‘Trough of Disillusionment’-‘Slope of Enlightenment’; Forming-Storming-Norming-Performing)

A Make use of phenomena occurring during the discontinuous shift from one S-curve to another.

◦ Awareness of the requirements of different stages – conception, birth, development, maturity, retirement – of a project (e.g. shifting manpower requirements, shifting budget requirements).

◦ Tendency to relax after receiving a Quality Award, Innovation Award, etc.

◦ Alvin Toffler’s stated need for companies to ‘learn, un-learn and re-learn’ as economies shift from disruptive wave to the next

◦ Forming/storming/norming/performing phases of team development – e.g. take advantage of enthusiasm dip during storming-norming

◦ Things almost always get worse before they get better during a discontinuous shift – proactively use this downshift to rethink processes

◦ Shifting the emphasis between operational-excellence/continuous-improvement (ordinary world) and step-change innovation (special world) according to the ‘pulse- rate’ of the industry

B Use phenomena occurring during disruptive shifts in an economy. (Make use of macro- scale business phenomena.)

◦ Take account of transition from a ‘bull’ to a ‘bear’ market (the time to buy is often when everyone else is selling)

◦ Forest-fires and other ‘destructive’ events in nature are essential for clearing out dead wood and re-invigorating the environment (extreme example: the seeds of the Proteus Bush are only released following exposure to very high temperatures)

◦ Make use of increasing sense of community during an economic crisis period

◦ Following a major industry disruption, many new players will enter the domain. Over time the number of these players will converge to Three major players (Jagdish Sheth, Rule Of Three)

Principle 37. Relative Change

A Use the relative differences that exist in an object or system to do something useful.

◦ Personality matching (e.g. ‘starters’ and ‘finishers’) on work-teams

◦ Creative tension – some organisations employ two independent teams to develop a new product or process, and then compete them. This is often done using one

team constructed along ‘traditional’ lines, and the other using a smaller number of ‘maverick’ types; ones that don’t fit well into traditional structures

◦ ‘Underdogs’ tend to perform beyond their capability when pitted against stronger competition (and the ‘public’ often tends to root for them more)

◦ 4th stage of learning – unconscious incompetence, conscious incompetence, conscious competence, unconscious competence

B Make different parts of a system act differently in response to changes.

◦ Expand or contract marketing efforts depending on the product’s rate of sales and profitability

◦ Good-cop/bad-cop negotiator team

◦ Expand R&D and development activities as production work shrinks during a market downturn

◦ Shifting combination of high risk and high-stability investment strategies during market turbulence

◦ Creation of off-shoot companies to better exploit new product developments

C Change one aspect of a system or process relative to another (possibly dynamically).

◦ ‘What got you here, won’t get you there’ (Marshall Goldsmith on career progression)

◦ Pincer movement during war-gaming

◦ Football teams shift balance between attacking and defensive players when making substitutions during a match, depending on state of play

◦ Playing strategy changes in cricket depending on duration of game – test cricket is different to one-day is different to 20-over

◦ Supermarkets manage the ratio of private-label to branded and commodity-to- luxury goods according to prevailing economic conditions

D Use second and higher order derivative changes.

◦ (Dynamically) tie investment strategy to rate of change of share prices

◦ Corporate accelerators support early-stage startup companies through mentorship and often capital and office space according to growth rate

◦ ‘Generation Flux’ – entrepreneurs who’ve learned to thrive in a world where everything is transient and there is no such thing as ‘steady-state’ any more

◦ John Boyd OODA-loop – the enterprises that can operate the Observe-Orient- Decide-Act cycle fastest will win the dogfight… the first thing they need to observe is what the cycle-time and how fast is it changing

Principle 38. Enriched Atmosphere

(frequently used interpretations: gamification, moonshot, BHAG)

A Replace a normal atmosphere with an enriched one.

◦ Risk and Revenue Sharing Partnerships

◦ Guest speakers at a seminar

◦ ‘burning platform’

◦ Use internal subject matter experts

◦ Use simulations/games instead of lecture-style training

◦ Injection of new-blood/new challenge into a team

◦ ‘It seems safe to say that significant discovery, really creative thinking, does not occur with regard to problems about which the thinker is lukewarm’. Mary Henle

◦ A fired-up, empowered, appreciated individual will do the work of three who aren’t

◦ South West Airlines POS – Positively Outrageous Service

◦ Consider personal chemistry issues when assembling a project team – find people who will spark-off interesting reactions with each other

◦ ‘Leadership is a potent combination of strategy and character. But if you must be without one, be without strategy.’ General H. Norman Schwartzkopff

◦ The Strategy Of Beautiful Women (Sun Tzu Strategem #31): Beautiful women arouse intense feelings in those around them – lust, envy, jealousy, envy, etc – thus creating an atmosphere of irrationality and confusion that can be exploited to achieve victory

◦ The Strategy Of Sowing Discord (Sun Tzu Strategem #33): Disrupting the environment of the enemy will disrupt his harmony thus interfering with the ability to make a coherent attack or defence

B Expose a highly enriched atmosphere to one containing potentially ‘unstable’ elements.

◦ Corporate Jester/’Trickster’/Fool – someone who is paid to provoke the system and ask the difficult questions that often don’t get asked

◦ ‘Devil’s Advocate’

◦ Hostile takeover…

◦ …’Poison pill’ strategy by target enterprise to counteract hostile takeover bid

◦ ‘Thriving on Chaos’ (Tom Peters) – enterprises that learn to take advantage of chaotic times rather than merely battening down the hatches to survive them and so actively promoting market chaos

◦ ‘I like Bartok and Stravinsky. It’s a discordant sound and there are discordant sounds inside a company. As president you must orchestrate the discordant sounds into a kind of harmony. But you never want too much harmony. One must cultivate a taste for finding harmony within discord or you will drift away from the forces that keep a company alive’ Takeo Fujisawa, Honda co-founder

Principle 39. Calmed Atmosphere

A Replace a normal environment with a calmed or inert one.

◦ Moves away from the (normal) disruptive performance appraisal, merit award, and reward environment to an (emotionally neutral) fairer system of working practice

◦ Hare Brain, Tortoise Mind

◦ Time-outs and cooling-off periods during negotiation

◦ ‘Away-day’s/ team-building days

◦ Corporate Retreats

◦ De-compression Zone

◦ Operations Room – e.g. for planning organisational change, proposal submissions, contract tendering, etc.

B Add neutral or inert elements to an entity, process or system.

◦ Use of neutral third parties during difficult negotiations (e.g. Senator George Mitchell in Northern Ireland, ACAS, etc.)

◦ Introduction of ‘quiet areas’ into the workplace

◦ ‘Detox’ diet

◦ Rest breaks/’pause for reflection’ breaks in meetings

◦ Bass-player, Derek Smalls, in Spinal Tap (greatest movie of all time) acts as the ‘lukewarm water’ between the fire and ice personalities of the band’s two leaders

◦ ‘Semi-retirement’ jobs to smooth the transition between full employment and retirement

Principle 40. Composite

A. Change from uniform to composite structures where each element is optimized to a particular functional requirement.

• #-Shaped individuals combine (vertical) domain expertise with (horizontal) integrative disciplines (Reference 46)

• Multi-disciplinary/cross-functional project teams.

• Do training with a combination of lecture, simulations, on-line learning, video, etc.

• Employ different personality types (e.g. Myers-Briggs) on a team

• Hard person/soft person negotiating team.

• ‘Small is beautiful’ – appreciation for diverse, interconnected systems

• Positional players in a football team

• Combined high risk/low risk portfolio-based investment strategy

• Conglomerate organization builds a suite of complementary business units where market down-cycles in some businesses are compensated by up-cycles in others

• Urban transport ‘eco-system’ combines and integrates multiple interdependent transport modes with aligned timetables

• ‘A change is as good as a rest’ – deliberately create a blend of task types to work on during different times of day/different days/different weeks

Into The Future

The ideal Contradiction Matrix is no Contradiction Matrix. The ideal problem solves itself. So why generate this third version of the Business Matrix? Why are we still contemplating a further edition of the Technical Matrix (Reference 47)? And maybe even updating the version of the Matrix for software and IT problems (Reference 48)? And why is it likely we might finally get around to the long-promised Matrix for human relationships?

If Systematic Innovation is good at one thing, it is predicting the future. When we use the method to map out the future of the method, it offers up some very clear compass headings. It looks something like this:

Figure 54: Long-Term ‘Inevitable’ Future Of Contradiction Tool

The ultimate Ideal Final Result (IFR) we’re working towards involves a situation, over on the right-hand side of the Figure, in which problems identify and resolve themselves. This, we think, will be the time when AI systems are prevalent and doing a lot of the things that have become too complex for any group of humans to do. It’s an inevitable consequence of a ‘post-singularity’ world: computers will be smarter than humans and will be better able to do the ‘creative’ job that humans believe to be their exclusive domain. When we observe these kinds of worlds in movies, they’re usually dystopian in nature, and thus they create a lot of concern in the eye of the public. What this concern should tell us is that the AI world has a number of contradictions they are going to have to overcome in order to merit the trust of society. When we get to this final – Version 6 – level of capability, the AI will recognise and be able to solve such contradictions. If I had to guess – and as we often say, getting the timing part of any prediction is much, much harder than working out where the world will evolve – I’d say this sixth evolution stage will be with the pioneers in the next fifteen to twenty years.

There’s an inevitable stage prior to that – Version 5 in the Figure – where our software systems will be able to identify problems (especially ‘contradictions’, which, by the time this version comes along, everyone will recognise are the only problem types of any real significance) and automatically suggest a comprehensive suite of solution suggestions. Humans, at this stage, will still have the final ‘say’ in whether, when and how such solution suggestions get implemented. We’re still ‘in the loop’. Meaning that the ‘final’ contradiction

to be solved – the one that gets us from 5.0 to 6.0 – involves acceptance by society that the system knows better than those in political power.

Working further backwards, Version 5.0 is preceded by Version 4.0. In this fourth major problem-solving capability evolution jump, the focus is likely to be on Contradictions and systems will be designed that will automatically identify (and rank) contradiction problems, and assist those people responsible for creating and delivering solutions with generic (i.e. Inventive Principle-base) solution directions. ‘Solution clues’ if you like, that the human will then be tasked with making sense of and configuring the solutions that will be progressed to prototyping and test. This 4th generation tool is where the current SI team is devoting much of its attention, and has been for the last couple of years. It will be the next major iteration of the ‘Contradiction Matrix’, and it in effect means that this book – the 3.0 Version of the Matrix – is likely to be the last version for which a physical book makes any kind of sense. There may be paper or electronic versions of a Version 3.1 and 3.2, but more likely than not, we will see the shift to more automated solutions sooner rather than later.

We’ll discuss this more in a few minutes, meanwhile, it still feels like the Contradiction- solving world is still experiencing a proliferation of Matrices, and Matrices that are getting more complex. The number of Parameter in this 3.0 Version of the Business Matrix, for example, has increased from 31 to 45. What we’re seeing is one of the fundamental trends described within TRIZ – that of increasing complexity followed by decreasing complexity. Or rather increasing number of components followed by decreasing number of components (see Reference 5, Chapter 14 for more details on why the difference between these two is important). The increasing number of Matrices is simply a system in the first half of the trend

– Figure 55.

Figure 55 Number of Components Trend in Relation To TRIZ Contradiction Tools

Why is this characteristic expected to be relevant to the evolution of the Contradiction Matrix? There are several answers to this question. The first relates to the needs and desires of users of the Matrix: For a long time the classical Contradiction Matrix was viewed as a ‘good enough’ or ‘sufficient’ tool (albeit, as discussed in the Introduction, some TRIZ researchers have walked away from the concept completely). But when the business community began to become interested in TRIZ, it quickly became apparent that the conceptual elegance of the Matrix was not matched by its relevance to typical business situations. This phenomenon was the main spur for the creation of the Business Matrix. Similarly when observation of the software development sector was begun, it also became apparent that people were attracted to the conceptual elegance of the concept, and then disappointed when they found it difficult to relate their particular problems to the generic parameters contained in the Matrix. As a consequence, we have been creating new bespoke, sector-specific matrix tools for corporate clients tailored to the needs of their specific circumstances for several years now.

It is important to recognize that we are not trying to filter out the ability of TRIZ to transfer ideas from one sector to another with any of these specialized matrices, but merely to make it easier for users to translate their specific problem into the generic problem – Figure 56. Beyond that, it is the job of the ‘Version 2’ and ‘Version 3’ Matrices to identify the best generic solutions from across all fields.

Figure 56 : (Version 2 & 3) Matrices Help Make the Transition From Specific To Generic Problem

Whichever way a TRIZ user looks at it we have to hope that we’re now somewhere close to the top of the Figure 55 complexity curve. If you’re a newcomer to the TRIZ world, the menu of options is already a significant hurdle to adoption. So, what about the second half of the component count trend curve? What about the ideal Contradiction Matrix? The ideal Matrix is the one that presents the users with the best generic solutions without the Matrix actually having to exist at all. At least, as far as the user is concerned it shouldn’t exist. The Ideal Matrix would offer the shortcut illustrated in Figure 57.

Figure 57 The Ideal Matrix… Is No Matrix

The emergence of this Ideal Matrix was first observable in our ‘Contradiction Explorer’ tool. This was a tool that allowed a user to type the name of an attribute they were trying to work with into a piece of software that would direct them towards which of the Matrix Parameters best matched what they were looking for. Today that capability has evolved to become the PanSensic ‘Contradiction Finder’.

PanSensic (Reference 45) is a suite of semantic tools designed to read through unstructured narrative text (social media, company reports, patents, etc) and to look for evidence of a range of different things that, as problem solvers we might like to understand – who are the ‘influencers’? Who’s telling the truth? What are people frustrated about? And, in the case of the Contradiction Finder, what are the contradictions they are experiencing?

Herein lies a paradox, if we directly go and talk to, say, customers, and ask them about contradictions, the large majority won’t know what we’re talking about, and won’t be able to answer our question. And yet, when we examine their narrative it becomes very apparent, very quickly that the contradictions are there. They’re somewhere close by whenever we read or hear the word ‘but’ for ‘however’, or ‘unfortunately’, or a host of other contradiction signifiers. Once we pick up these words, the only other thing we need is a bit of software smart enough to look upstream and downstream of these signifier words and identify what the two sides of the contradiction are. Then, finally, we need to map them to a taxonomy that allows us to map those problems to equivalent problems that others might have experienced (and solved) previously. This taxonomy, of course, is the exact same ones as are found in the various different Contradiction Matrices. Bolt all these elements together and it becomes possible to scrape through terabytes of narrative text and automatically construct pictures like this:

Figure 58 Typical Contradiction-Finder ‘Heat-Map’ Output

And from here it’s only a relatively minor step to achieve what Figure 58 hints at: enabling users to click on the boxes where the Finder has identified that high numbers of contradictions, and automatically receive a ranked list of Inventive Principles that others have successfully used to resolve the problem.

The idea behind the Contradiction Finder is that eventually users of any background will simply be able to point the software at any kind of narrative text in their own language and using their jargon and automatically identify the most significant areas where improvement can be achieved.

So why not just go straight to this Ideal Final Result? Or even the Version 6 ideal? The answer lies in the fundamental phenomena underlying the increasing-decreasing complexity trend. Without having worked out the ‘right’ routes from specific problem to right generic solution, it is not possible to eliminate the Matrix. It is only by acquiring the data to populate the various different Matrices that enough data will be acquired to ensure effective recommendations when a user types in their problem. It is not possible to ignore the complexities of the world in order to create a meaningful, yet simple to use tool. They have to be understood for the complexity to be incorporated into a tool that, while it might/ought to be hidden from the user, is nevertheless still there in the background. The proliferation is an essential requirement along the road to a more ideal system. And likewise, the decreasing complexity part of the Figure 55 curve is often about the absorption of complexity into the sub-system rather than its elimination.

The road to the ‘ideal matrix’ (Version 4) may still take one or two more years to travel. It will almost certainly result in the production of a capability that is better suited to delivery through web-based software tools. In the meantime, we trust that this book will deliver benefits considerably beyond those possible via the two previous generation Matrices.

Given the apparent universality of the 40 Principles (over nine million case studies and counting – we’re currently able, thanks to today’s Contradiction Finder, to analyse several thousand new cases a week), to all intents and purposes it is fair to say that if there is a solution to the conflict you are trying to resolve, it is in here. Imagine the most difficult challenge you might expect to face, something that hasn’t been solved after a considerable amount of prior effort. Now imagine the day when you discover your dream solution. Or worse, you discover your competitor beat you to it. Now picture the SI research team finding the solution and doing their usual reverse engineering job on it. It is guaranteed (well, 99.999%) when that job is done, the answer will fit one or a combination of the strategies suggested by the Inventive Principles. The answer really is in here. The Matrix gives everyone a systematic structure to get to these kinds of answers. The winners will be those with sufficient persistence to stay with the process until the end. As in so many other aspects of life, the persistent will rule.

CCO.

So much for the future of the Business Matrix and the business of revealing and solving enterprise conflicts and contradictions. The future value of such a tool is highly dependent on how well those enterprises come to understand the importance of conflicts and contradictions in determining their future success. With that in mind, we have been having discussions with a number of our clients about the need for someone inside the enterprise with the responsibility to ensure they are built into the strategic and planning process. With the most advanced, we’ve been discussing that this should be a Board-level position. Welcome the Chief Contradiction Officer.

When we first started these discussions it was not long after encountering the book, ‘Dealing With Dilemmas’ (Reference 49). The book represents one of the first serious attempts to examine enterprises, and more specifically the management of enterprises through the lens of contradiction. Author, Frank Buytendijk, identified six key contradictions that businesses need to address. The six came through an examination of the conflict between what he identified as the key silos that exist within a generic organization. While we liked the basic idea, because Buytendijk didn’t have the advantage of knowing any TRIZ/SI, his model suffered since it missed a couple of significant parts of the story. When we apply the Law Of System Completeness to define the minimum number of elements that need to be present in order for any enterprise to function, we know there need to be a minimum of six elements. Then, if we take the Buytendijk’s idea that the core contradictions inside any organization occur between the essential elements, we end up with fifteen fundamental contradictions. Something like this:

Figure 59 Fifteen Fundamental Enterprise Contradictions

Next up comes the search to identify what these contradictions are in more tangible terms. We can take our start point here, again from Buytendijk. The key contradiction between the ‘growth/learning’ (Engine) element of the enterprise and Finance (Sensor) – contradiction number 6 in the Figure – is that between the long-term and the short-term. In that the principal role of Finance is to look after today’s money, while the job of the growth/learning parts of the enterprise are all about creating tomorrow’s revenues.

Here’s what we think the other 14 fundamental inter-element contradictions look like:

Between

Core Contradiction

1

Coordination-Engine

Stability v Dynamic

2

Coordination-Transmission

Top-Down v Bottom-Up

3

Coordination-Tool

Sustain v Disrupt

4

Coordination-Interface

Reductive v Expansive

5

Coordination-Sensor

Action v Interaction

6

Engine-Sensor

Long-Term v Short Term

7

Engine-Interface

Listen v Lead

8

Engine-Tool

Optimise v Innovate

9

Engine-Transmission

Insource v Outsource

10

Transmission-Sensor

Fixed v Variable

11

Transmission-Interface

Inside-out v Outside-in

12

Transmission-Tool

Past v Future

13

Tool-Sensor

Open v Closed

14

Tool-Interface

Means v Ends

15

Interface-Sensor

Value v Profit

Table 3: Fifteen Core Enterprise Contradictions

Hopefully, most of these contradiction pairs will sound fairly obvious. That said, in our experience working with many of the world’s biggest organisations that no-one ever seems to be responsible for managing any of them. In the majority of situations, we think there is an implicit assumption that these contradictions are ‘inherent’ and that there is nothing that can be done about them. In a similar majority the contradictions have either always been invisible or have allowed to become invisible.

At best, when we see organisations heading towards a crisis, we will find assorted types and form of ‘tiger-team’ or ‘rapid-reaction-force’ established to tackle, for example, ‘out- sourcing’, or ‘profit-maximisation’. The problem with these kinds of mon-istic management strategy is that they tend to deliver success along the nominated direction, but unfortunately at the expense of another dimension. And so, sadly, we end up with cost reduction programmes that end up increasing costs, bottom-up ‘empowerment’ initiatives that alienate everyone at the bottom of the pyramid, and so on.

If TRIZ teaches us nothing else, it is the importance of solving the problems that exist between contradicting parameters. And that’s where we the Chief Contradiction Officer (CCO) role comes into play: a person positioned above all of the silos and tasked with actively challenging these 15 core contradictions.

Even the smallest enterprise these days is a complex web of hierarchically nested interdependencies. The Law Of System Completeness needing to be satisfied at each and every level of that hierarchy. Which means someone needs to be responsible for contradictions all the way up to the top and all the way down to the bottom. The CCO is the person who needs to be responsible for coordinating all of them. But then, specifically, needs to be able to sit above all of them, actively leading the ‘Top 15’ described here.

We first introduced the concept of a CCO in the Innovation Capability Maturity Model (ICMM) (Reference 22). We introduced it as an essential role in any Level 4 or 5 enterprise. Putting innovation on one side and looking more holistically at the enterprise as a whole, the more we see the incredibly high levels of fragility in most of the management teams, the more we think the CCO role is needed in all forms and Levels of enterprise already. In the future, we don’t think it will be a choice at all: enterprises will look after conflicts and contradictions or die.

References

1 Altshuller, G., ‘The Innovation Algorithm: TRIZ Systematic Innovation And Technical Creativity’, Technical Innovation Center, , Worcester, MA, 1999.

2 Mann, D.L., Dewulf, S., Zlotin, B., Zusman, A., ‘Matrix 2003: Updating The TRIZ Contradiction Matrix’, IFR Press, 2003.

3 Mann, D.L., ‘Matrix 2010’, IFR Press, 2009.

4 Mann, D.L., Dewulf, S., ‘Updating The Contradiction Matrix’, paper presented at TRIZCON’03, Philadelphia, 16-18 March 2003.

5 Mann., D.L., ‘Hands-On Systematic Innovation For Business & Management’, IFR Press, 2nd Edition, 2007.

6 Rosenzweig, P., ‘The Halo Effect… And The Eight Other Business Delusions That Deceive Managers’, Simon & Schuster, 2007.

7 Collins, J., ‘Good To Great’, Random House Business, 2001.

8 Weiner, E., ‘The Geography Of Genius: A Search For The Worlds Most Creative Places, From Ancient Athens To Silicon Valley’, Simon & Schuster, 2016.

9 Hsieh, T., ‘Delivering Happiness: A Path to Profits, Passion, and Purpose’, Business Plus, 2010.

10 Robertson, B.J., ‘Holacracy: The Revolutionary Management System That Abolishes Hierarchy’, Henry Holt & Co., 2015.

11 Mann., D.L., ‘Connecting Real IP Value To Business Strategy’, SI White Paper Series, www.systematic-innovation.com

12 Mann, D.L., ‘Updating TRIZ: 2006-2008 Patent Research Findings’, keynote address at 4th Japan TRIZ Symposium, September 2008.

13 Deci, E. L., & Ryan, R. M. (1995). Human autonomy: The basis for true self-esteem. In M. Kernis (Ed.), Efficacy, agency, and self-esteem (pp. 3149). New York: Plenum.

14 Rock, D., ‘SCARF: a brain-based model for collaborating with and influencing others’, NeuroLeadership Journal, Issue 1, 2008.

15 Systematic Innovation E-Zine, ‘ABC-M, SCARF And Self-Esteem As A System’, Issue 176, November 2016

16 Matchett, E., ‘Fundamental Design Method: An Introduction’, 1999, Reprinted with new Introduction, IFR Press, 2009.

17 Mann, D.L., Howarth, P., ‘Pansensics: Measuring What’s Important Rather Than What’s Easy’, SI White Paper Series, www.systematic-innovation.com

18 Systematic Innovation E-Zine, ‘A Day In The (Trade-Off) Life’, Issue 159, June 2015. 19)Systematic Innovation E-Zine, ‘Re-Thinking Physical Contradictions #2: Business

Problems’, Issue191, February 2018.

20 Mann, D.L., Ozozer, Y., ‘TrenDNA: Understanding Populations Better Than They Understand Themselves’, IFR Press, 2009.

21 www.atlasofemotions.org.

22 Mann, D.L., ‘Innovation Capability Maturity Model: An Introduction’, IFR Press, 2012.

23 Westrick, R., Cooper, C., ‘Winning By Design: Practical Application Of Lean Principles For Transforming The Speed To Market, The Quality, And The Costs Of New Product Development’, Simpler, 2012.

24 Systematic Innovation E-Zine, ‘Case Study: Nationalisation Versus Privatisation’, Issue 184, July 2017.

25 Systematic Innovation E-Zine, ‘Case Study: Equity (Or Not)’, Issue 173, August 2016. 26)Systematic Innovation E-Zine, ‘Case Study: Of David’s And Goliath’s’, Issue 169,

April 2016.

27 Mullins, J., Komisar, R., ‘Getting To Plan B: Breaking Through To A Better Business Model’, Harvard Business Review Press, 2009.

28 Lueke, R.A., ‘Scuttle Your Ships Before Advancing: And Other Lessons from History on Leadership and Change for Today's Managers’, Oxford University Press, 1993.

29 Systematic Innovation E-Zine, ‘Right-versus-Right versus Right-versus-Wrong’, Issue 183, June 2017.

30 Systematic Innovation E-Zine, ‘First Principles First’, Issue 184, July 2017. 31)Edwards, M.A., Roy, S., ‘Academic Research In The 21st Century: Maintaining

Scientific Integrity In A Climate Of Perverse Incentives & Hyper-Competition’, Environmental Engineering Science, Vol.34, No.1, 2017.

32 Mann, D.L., ‘Artificial Intelligence Is Neither’, Blog article, www.darrellmann.com, 27 October 2017.

33 Cialdini, R., ‘Pre-Suasion: A Revolutionary Way To Influence And Persuade’, Random House Business, 2016.

34 Beer, S., ‘Diagnosing the System for Organizations’, Wiley, Chichester, 1985. 35)Systematic Innovation E-Zine, ‘PanSensics: Complexity Landscape’, Issue150,

September 2014.

36 Amabile, T., ‘The Progress Principle: Using Small Wins to Ignite Joy, Engagement, and Creativity at Work’, Harvard Business Review Press, 2011.

37 Fenn, J., Raskino, M., ‘Mastering the Hype Cycle: How to Choose the Right Innovation at the Right Time’, Harvard Business Review Press, 2008.

38 Ortony, A., Turner, T. J., ‘What's basic about basic emotions? Psychological Review, 97, 315-331, 1990.

39 Covey, S.M.R., ‘The Speed of Trust: The One Thing that Changes Everything’, Simon & Schuster, 2006.

40 Coleman, D.A., ‘The Path to Engagement: Enjoy More Growth, Happiness And Success’, Good Habits Ltd, 2016.

41 Frankl, V.E., ‘The Will To Meaning’, Penguin Books Ltd, re-edited edition, 1985. 42)Matchett, E., ‘The Road To True Professionalism’, originally published in 1994; IFR

Press edition, 2013.

43 Csikszentmihalyi, M., ‘Flow: The Psychology of Happiness: The Classic Work on How to Achieve Happiness’, Rider, New Edition, 2002.

44 Systematic Innovation E-Zine, ‘The Role Of Measurement In Innovation Attempt Failures’, Issue 163, October 2015.

45 www.pansensic.com

46 Systematic Innovation E-Zine, ‘# Landscapes’, Issue186, September 2017. 47)Mann, D.L., ‘Matrix 2018’, IFR Press, in press.

48 Mann, D.L., ‘Systematic (Software) Innovation’, IFR Press, 2007.

49 Buytendijk, F., ‘Dealing With Dilemmas: Where Business Analytics Fall Short’, John Wiley & Sons, 2010.