Systematic Innovation

e-zine

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In this month's issue:

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

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McKinsey 7S Model and The Law Of System Completeness

"How wonderful that we have met with a paradox.
Now we have some hope of making progress."
Niels Bohr

There are many ways to skin a cat. There are many more ways of looking at organizations. One of the most well known of the organization segmentation models is the McKinsey 7S Framework Model, first conceived by well-known 'In Search Of Excellence' business consultants Robert Waterman and Tom Peters in the 1980s. The seven-segment model (Figure 1) is most often used as a tool to assess and monitor changes in the internal situation of an organization. The model is based on the theory that, for an organization to perform well, the seven elements need to be aligned and mutually reinforcing. As such, the model is intended to be used to help identify what needs to be realigned to improve performance, or to maintain alignment (and performance) during change of whatever form.

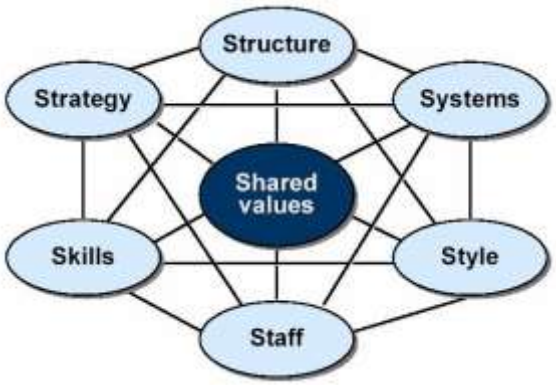


Figure 1: McKinsey 7S Framework Model

While neither Waterman nor Peters made any explicit claim that the model was intended to represent what we might think of as a 'complete' representation of an organization, it has certainly come to be interpreted that way in more recent times.

Another organizational model – this time one that clearly does claim to offer a 'complete' representation – is the one found in the TRIZ Law Of System Completeness. In its generic form, this model contains the five elements illustrated in Figure 2:

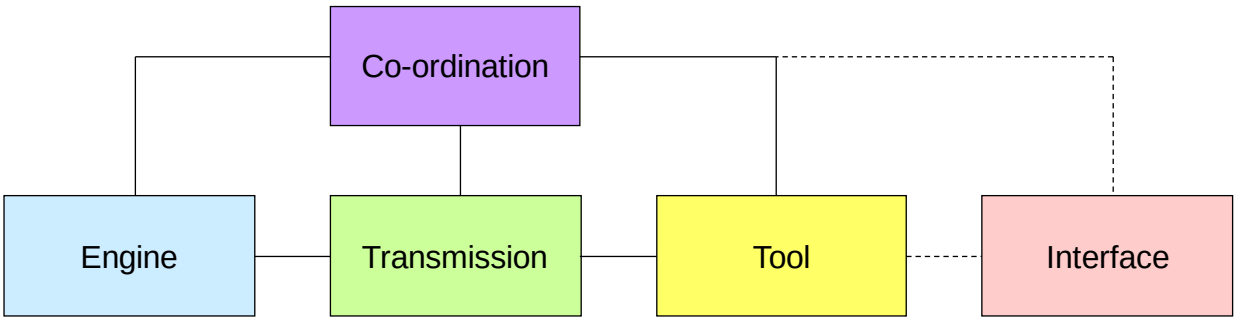


Figure 2: TRIZ Law Of System Completeness

Comparing the two models quickly reveals a pair of paradoxes: five is clearly not the same as seven; and five is claimed to be complete while seven is not. Clearly there is a difference of perspective here that bears some deeper analysis: if both models are 'right' then there must be a higher level model that unites both of them.

Looking first of all for differences between the two models, it quickly becomes clear that the 7S story contains a combination of tangible (staff, strategy, structure, systems) and intangible (skills, style, shared values) elements that the Law Of System Completeness does not. This is not to say that the Law precludes or excludes a division into tangible and intangible worlds. Indeed, when thought about in a business context, it is quite clear that the Law must apply in both contexts. A viable organization system, in other words, must simultaneously contain a viable tangible system and a viable intangible system. Figure 3 shows how we might simply integrate those two viable systems into the same basic model:

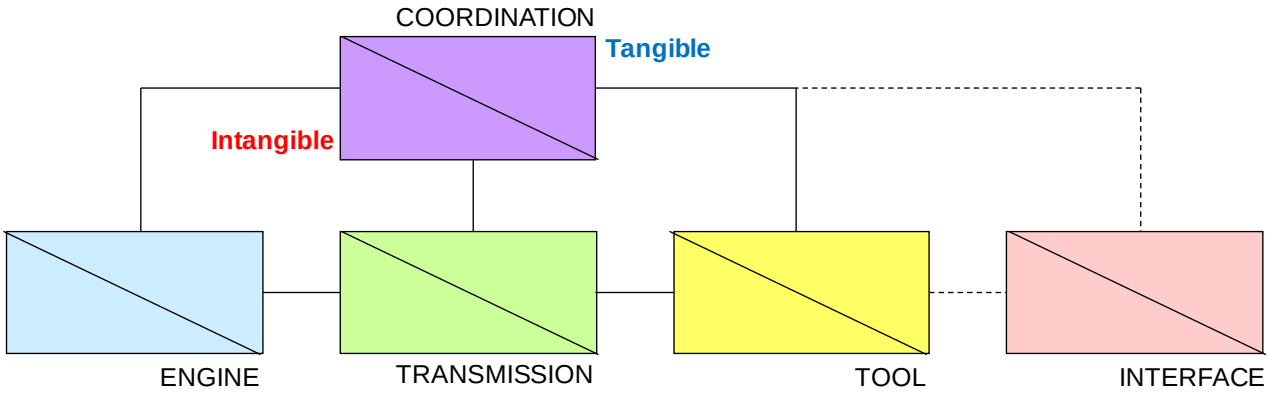


Figure 3: TRIZ Law Of System Completeness Highlighting Parallel Tangible& Intangible Worlds

Having found this common ground it should be easier to match the common ground between this new Law picture and the 7S model.

Starting at the highest level, the 'Coordination' box from the Law is typically interpreted as the part of the system that is all about getting the other four parts to work together in a coordinated fashion. From a tangible perspective, the very direct link between this definition and the 7S's is that it corresponds to the 'Strategy' S. And, through a not much bigger stretch, the intangible high level aspect of the 7S is the 'Shared Values' element found at the centre of the Waterman & Peters model.

Next up, the 'Engine' element of the Law refers, as the name suggests, to the source of energy that makes the system – in this case, 'the business' – work. It is typically connected in the business sense to the people employed within the business. Which, looked at from tangible and intangible perspectives connects elegantly to the 'Staff' and 'Skills' aspects respectively from the 7S model.

Adjacent to the Engine, then, is the 'Transmission'. Again, typically this is interpreted as the part of the system that connects the source of energy (i.e. in this case the people) to the 'Tool', the tool being 'the thing that represents the useful outputs produced by the system'. From a business perspective, the 'Transmission' is all about processes and systems. Yet again, we might sensibly divide these into tangible and intangible aspects – the tangible being the Structures and Systems; the intangible being, to use the seventh and final element of the 7S model, the 'Style' of the business.

Making these connections allows us to plot the 7S model and Law on top of one another:

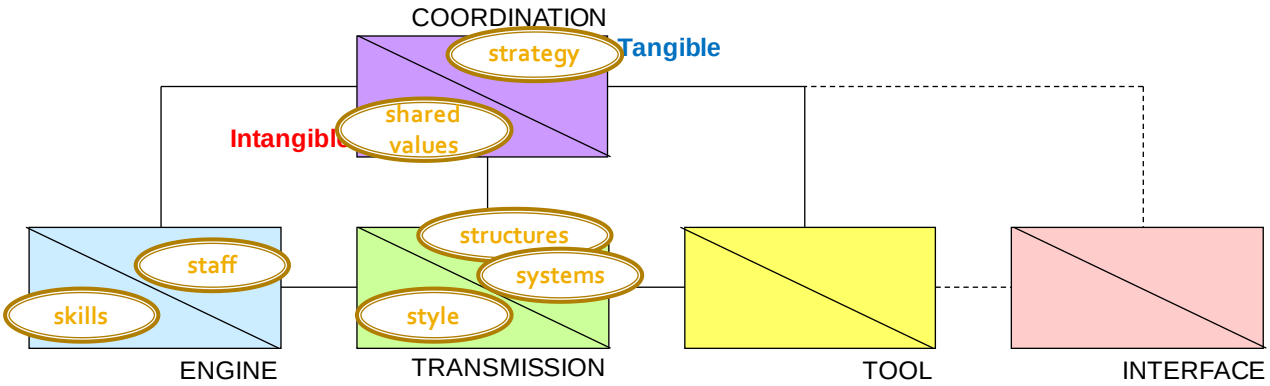


Figure 4: Mapping The 7S's Onto The Law Of System Completeness

Interestingly, the 7S model divides Structures and Systems into two separate aspects of the system. They are typically defined in the 7S world as follows:

Structures – the way the organization's units relate to each other; centralized/de-centralized, functional divisions (top-down/bottom-up); matrix/hierarchy; network, holding, etc

Systems – the procedures, processes and routines that characterize how work is to be done; financial systems; hiring; promotion and performance appraisal systems; information systems.

Both of which serve to say that they are fully consistent with the meaning of the tangible 'Transmission' aspect of the Law of Completeness. If we really wanted to get fussy and further question why Waterman and Peters split into two things what TRIZ defined as one, it is worth pointing out that the Law Of System Completeness is a representation of one level of a recursive system. Which means inside each of the five elements it will always be possible to construct another five elements (Figure 5). Should we choose to add in this recursive effect for the Transmission part of the Complete System, we quickly see that 'Systems' and 'Structures' actually sit at two different hierarchical levels – the 'Systems' sitting at a higher level such that they are the things that help determine the Structure ('help' because there are four other essential elements needed to define the lower level 'Transmission' system).

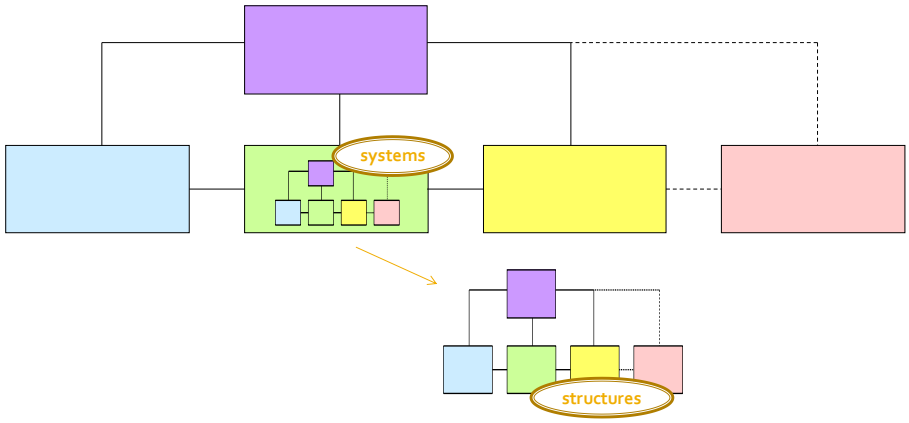


Figure 5: Recursion In The Law Of System Completeness

So much for mapping the 7S model onto the Law Of System Completeness. That exercise gives us the useful thought that we need to think about tangible and intangible worlds when we model business systems, and reminds us that the Law has to be applied

recursively. What about now turning the story around the other way to see what the Law of System Completeness might tell us about the 7S Model?

The best way to do this is to go back to Figure 4, where the two models were plotted one on top of the other. The most striking aspect of this picture is that two of the five 'essential' elements of a complete system as defined by TRIZ don't feature at all in the 7S model. According to TRIZ, in other words, the 7S model cannot be a complete viable system because it features neither a 'Tool' nor an 'Interface'.

Now, in defense of Waterman and Peters, as mentioned earlier, they never described the 7S's as a 'complete system', merely a good way of segmenting the internals of an organization to describe 'the way in which it operates'. And, looking at the five elements of the Law of System Completeness, the three elements covered by the 7S model are certainly the ones that cover the 'internal' aspects of the organization. No problem so far.

The Tool and the Interface are essential elements of a 'complete system' however since what TRIZ/SI's 3.5 million data-points tell us is that all five are needed, and, moreover, each will have an influence on the other.

In many ways, from a TRIZ perspective, the whole system starts and ends with the 'Tool'. This is the output produced by the organization. Tangibly it is the products and services that the customer pays for and, at the highest level, the 'shareholder value' that revenue helps to deliver; intangibly it is the brand image and the 'experience' provided to the customer. All of the internal systems, engine and coordination elements exist solely to deliver these outputs. And the outputs themselves are in turn only useful if the 'Interface' element is also present. The 'Interface' being the market demand, again divisible into tangible and intangible customer needs.

The 7S model may indeed be intended to cause users to focus on the internals, but in so doing they also tend to deflect attention away from the fact that the internals only exist to create output that the outside world values. As we said at the beginning, there are indeed many ways to skin a cat. Some of those ways do the job completely, and some – like the 7S framework model – take a somewhat incomplete view of the way things are. In our experience, the 'complete' approach is the only sensible one. Especially when, as is inherently the case when looking at organizations, we are trying to understand systems that are complex.

Case Studies: The Cross-Silo Project

(Part 1: Unravelling The Complexity)

This article represents the first in a two part case study focused on a real project conducted with a client in the telecom sector recently. Some of the details of the case have been changed in order to protect the confidentiality of the client and to make the outcome of the case more generically relevant to readers in other industry domains. This first part focuses on the work done to work out what the real problem to be solved was. The second part, next month, will describe the transition from problem definition to implementable solutions. One of the main reasons for splitting the article in this way is to allow readers and opportunity to examine the problem and make their own attempts to generate solutions. In that way, in addition to seeing how the various SI tools were used by the client, readers will be able to compare their thoughts with those that were deployed by the client.

The problem was ostensibly introduced as a business problem. Any and all business problems are inherently complex in nature with each stakeholder potentially holding quite different opinions as to what the issues are, and each in turn quite likely hold views about the problem that they don't feel able to discuss openly.

The main difficulty with 'business' problems in terms of presenting them to others is that very often they require a lot of descriptive text to convey to third party readers sufficient knowledge to meaningfully allow them to grasp the complexities. With that in mind, all we will say about this particular problem is that the organization in question was in the process of introducing a new service offering to complement their existing portfolio. The organization structure was still dominated by vertical structures, although the first moves towards a matrix structure had been successfully implemented, with the founding of a customer-facing, horizontally oriented project office. Members of this group were typically organized into teams responsible for ensuring the most seamless delivery to external customers as possible. The project team involved in this case study – we will call them 'Team G' – was three months into a nine month programme that, while it crossed several vertical departments, was primarily being conducted through personnel in two, Departments 'D' and 'E'. At the start of the exercise, instigated by Team G, the relationship between the two Departments, who had not really worked closely together before, was deemed to be 'difficult' and as a result the scheduled project completion date was in considerable jeopardy. At our request, it was decided to include a member from the organisation's HR department in the first session. The first 'unravelling the complexity' meeting was thus convened with us plus leads from each of the four perspectives, as shown in Figure 1:

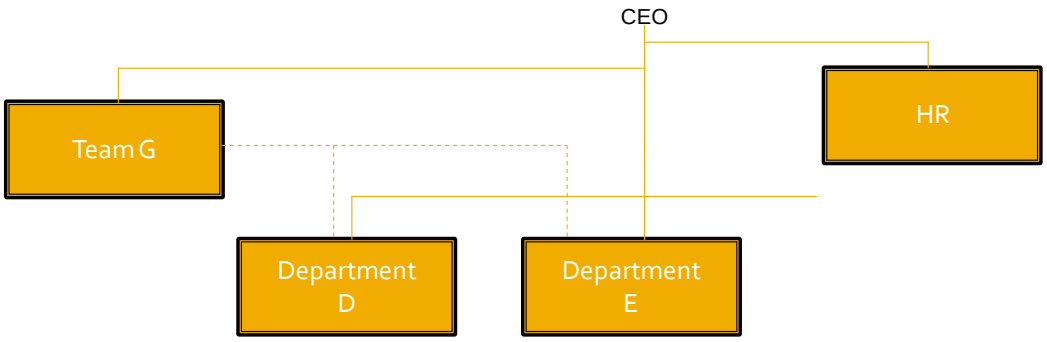


Figure 1: Problem Stakeholders

As is often the case with these kinds of fuzzy business problem, we started the first meeting by deciding to conduct a Perception Mapping exercise. The process was briefly described to everyone and then, after agreeing the basic question we wished to answer, each of the four group representatives was requested to write down their opinions about what was stopping the problem from being solved.

Agreeing the question we wished to answer was mercifully simple, and within a couple of minutes we had written down:

> **The project is failing to meet delivery expectations because….**

We then asked each of the four group representatives to individually write down their opinions about what statements should complete the sentence. After about ten minutes, we all came together to share the perceptions that had been written down. As per our usual convention, judgment or criticism of other people's comments was prohibited and the idea that they were 'merely' opinions rather than fact was emphasized.

Here's what the four representatives came back with:

Department D Leader:

- My team is de-motivated by the pace of change expected
- My team is afraid their jobs will disappear
- The project needs have not been properly communicated to me
- Others don't understand our way of doing things
- The project disrupts the system we have spent years perfecting
- Department E has a different quality ethic to us
- People take pride in their work, but have lost control over ability to deliver what they think is right
- If I deliver on the project, I fail on my KPIs
- My team has not been given the necessary training
- Slow response from everyone to our emails
- Project meetings not properly minuted so actions not done

Department E Leader:

- Department D cycle times are not well matched with ours
- Department D is too risk averse
- Department D refuse to allow us into their area
- The project team are glory hunters and will make themselves look good at our expense
- The project team does not trust us
- The project team doesn't understand the complexities of our job
- Department D bombards us with too many irrelevant emails
- There is no career development path for my team
- We are not provided with the data we need to properly drive the project
- My KPIs mean I have to focus on other matters
- Project delivery timescales have no contingency built in so we are always chasing our tail

Team G Leader

- Both departments don't see the bigger business picture
- Department D has been very defensive and protective of their patch
- The team is inexperienced in this domain
- Pressure from senior management is too great
- Lack of trust
- Mismatch between KPIs of different stakeholders
- Everyone relying on emails rather than meeting face-to-face

- Department D has a ‘can’t do’ attitude; everything has to be justified and re-justified
- No-one else understands the market pressure we are under and therefore treats the project with lower priority than other work
- Too much red-tape

HR Lead

- Both departments have had an easy life and are finding the project stressful
- Too much one-way flow of communications
- People are strongly ingrained in their own departments (job rotation offers have been declined)
- This is a new initiative for the company and we need time to iron out the wrinkles
- Sickness leave higher than average
- Personality mis-match between department leaders
- Mid-cycle KPI renegotiations continuing to fail

Next up the critical ‘leads to’ part of the process. Again, as per convention, we insisted that everyone did this as a single group. Table 1 presents a summary of the exercise after each of the raw statements had been compiled:

Perception	Identifier	‘Leads To’	Conflicts
My team is de-motivated by the pace of change expected	A	G	
My team is afraid their jobs will disappear	B	N	
The project needs have not been properly communicated to me	C	MM	W
Others don’t understand our way of doing things	D	E	
The project disrupts the system we have spent years perfecting	E	A	
Department E has a different quality ethic to us	F	HH	
People take pride in their work, but have lost control over ability to deliver what they think is right	G	AA	
If I deliver on the project, I fail on my KPIs	H	DD	
My team has not been given the necessary training	I	Y	
Slow response from everyone to our emails	J	HH	
Project meetings not properly minuted so actions not done	K	T	
Department D cycle times are not well matched with ours	L	CC	
Department D is too risk averse	M	D	
Department D refuse to allow us into their area	N	D	
The project team are glory hunters and will make themselves look good at our expense	O	S	
The project team does not trust us	P	AA	
The project team doesn’t understand the complexities of our job	Q	P	
Department D bombards us with too many irrelevant emails	R	CC	
There is no career development path for my team	S	A	
We are not provided with the data we need to properly drive the project	T	CC	
My KPIs mean I have to focus on other matters	U	S	
Project delivery timescales have no contingency built in so we are always chasing our tail	V	C	
Both departments don’t see the bigger business picture	W	EE	C
Department D has been very defensive and protective of their patch	X	N	
The team is inexperienced in this domain	Y	Q	
Pressure from senior management is too great	Z	V	

Lack of trust	AA	J	
Mismatch between KPIs of different stakeholders	BB	EE	
Everyone relying on emails rather than meeting face-to-face	CC	AA	
Department D has a 'can't do' attitude; everything has to be justified and re-justified	DD	D	
No-one else understands the market pressure we are under and therefore treats the project with lower priority than other work	EE	V	
Too much red-tape	FF	V	
Both departments have had an easy life and are finding the project stressful	GG	A	
Too much one-way flow of communications	HH	R	
People are strongly ingrained in their own departments (job rotation offers have been declined)	II	D	
This is a new initiative for the company and we need time to iron out the wrinkles	JJ	V	
Sickness leave higher than average	KK	V	
Personality mis-match between department leaders	LL	X	
Mid-cycle KPI renegotiations continuing to fail	MM	BB	

Table 1: 'Leads To' and Conflict Pair Analysis Result

The table also shows the results of the next stage of the process – identifying pairs of the perception statements that were in conflict with one another. After a few minutes deliberation, the group decided that there was one such pair – the Department D statement that they hadn't been told the project needs properly versus the Team G perception that they believed they had communicated the need very clearly, but that the Departments didn't see the bigger picture. The view from Team G's perspective being that somehow, they didn't actually *want* to understand the bigger picture.

Having completed the 'thinking' part of the process, Figure 2 illustrates the perception map then drawn using the Table 1 information:

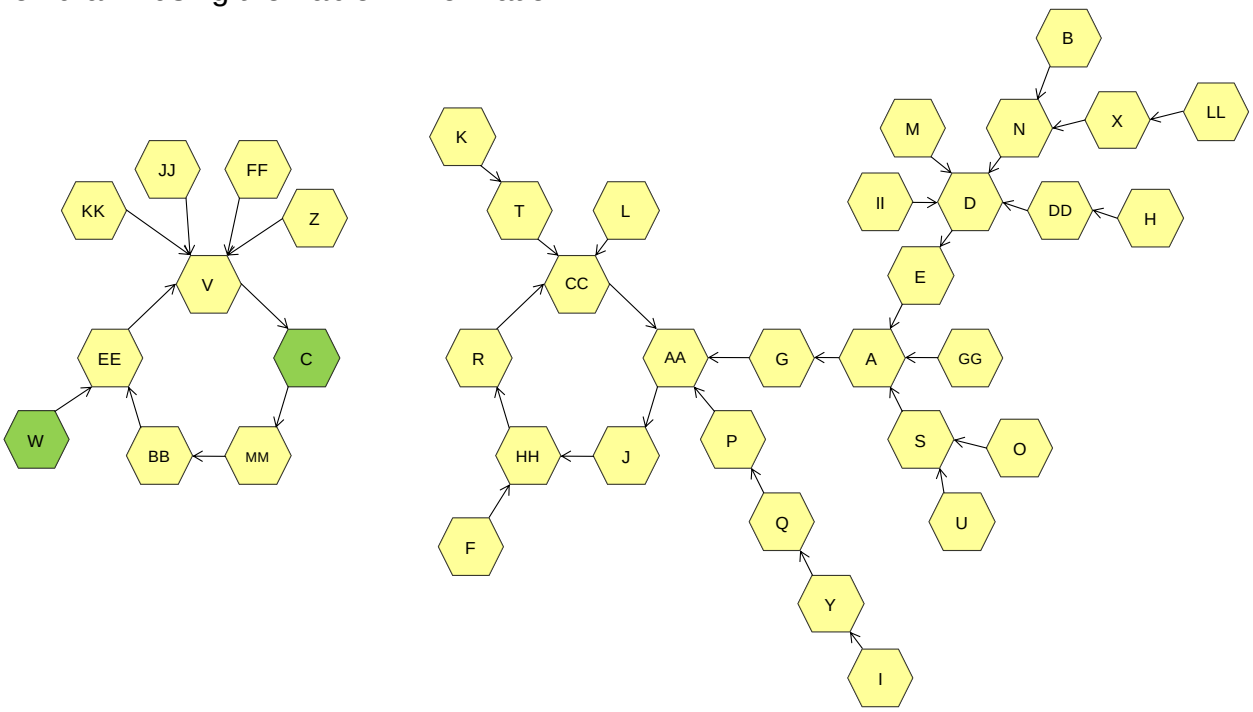


Figure 2: Overall Perception Map

The map was seen to be split into two separate 'islands, each with a loop at its heart. This immediately told us that there were two independent issues that would need to be resolved if the project was to achieve its delivery objectives.

We decided to examine each of the islands sequentially. We started with the smaller island on the left of the figure. As per usual convention, we focused on the perceptions in the loop, the collectors (perception V in this case) and the conflict chain (W-to-EE-to-V-to-C). This left us with the important perceptions shown in the picture reproduced in Figure 3:

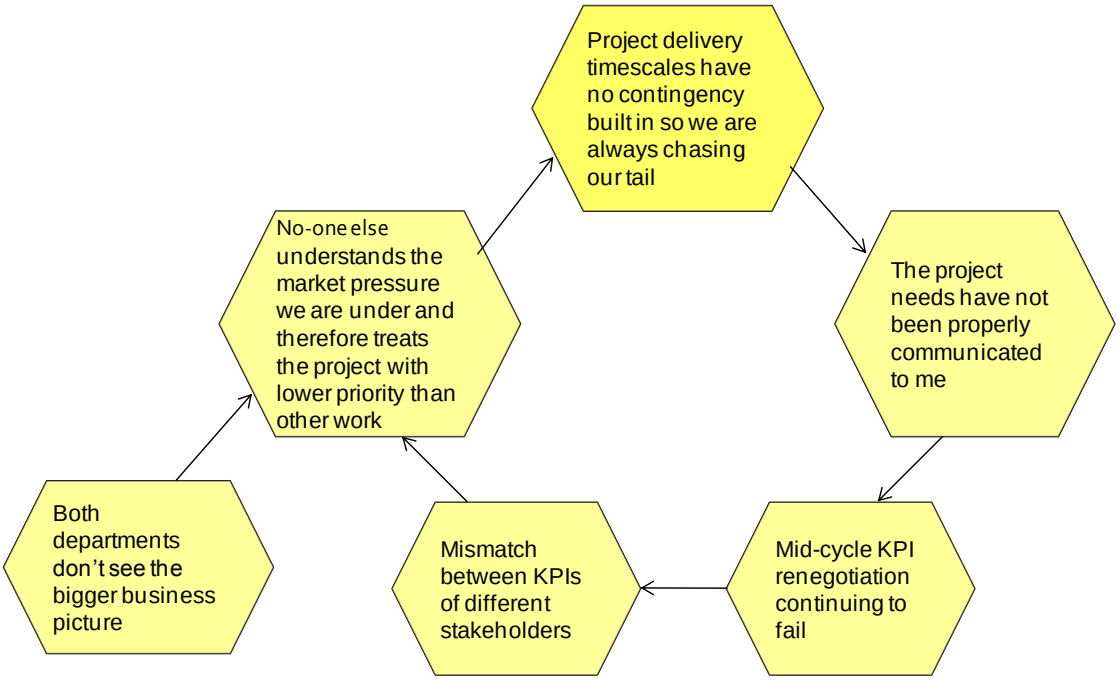


Figure 3: Perception Map – Island 1

With perception V 'timescales have no contingency…' emerging as the clear most important of the Perceptions (being in the loop,, in the conflict chain and a strong collector), this seemed to be a clear message about this part of the problem. Looking more broadly at the loop, the downward spiral it described made a strong connection between that lack of contingency and the issue of mis-alignment of KPIs. Taken together with the originally stated problem we want to solve ('achieving delivery objectives'), this indicated the contradiction we had to solve was the conflict pairings illustrated in Figure 4:

IMPROVING PARAMETERS YOU HAVE SELECTED:

Production Time (8)

WORSENING PARAMETERS YOU HAVE SELECTED:

Production Spec/ Quality/ Means (6) and Production Risk (9) and Production Interfaces (10) and Control Complexity (29)

Figure 4: Contingency/KPI Loop Conflict Mapping

Which, after being mapped onto the Contradiction Matrix, gave us the following prioritized sequence of Inventive Principles:

Figure 5: Contingency/KPI Loop Conflict Solution Principles

The second island then, distilled down to the image reproduced in Figure 6 after the loop and collector tests had been applied:

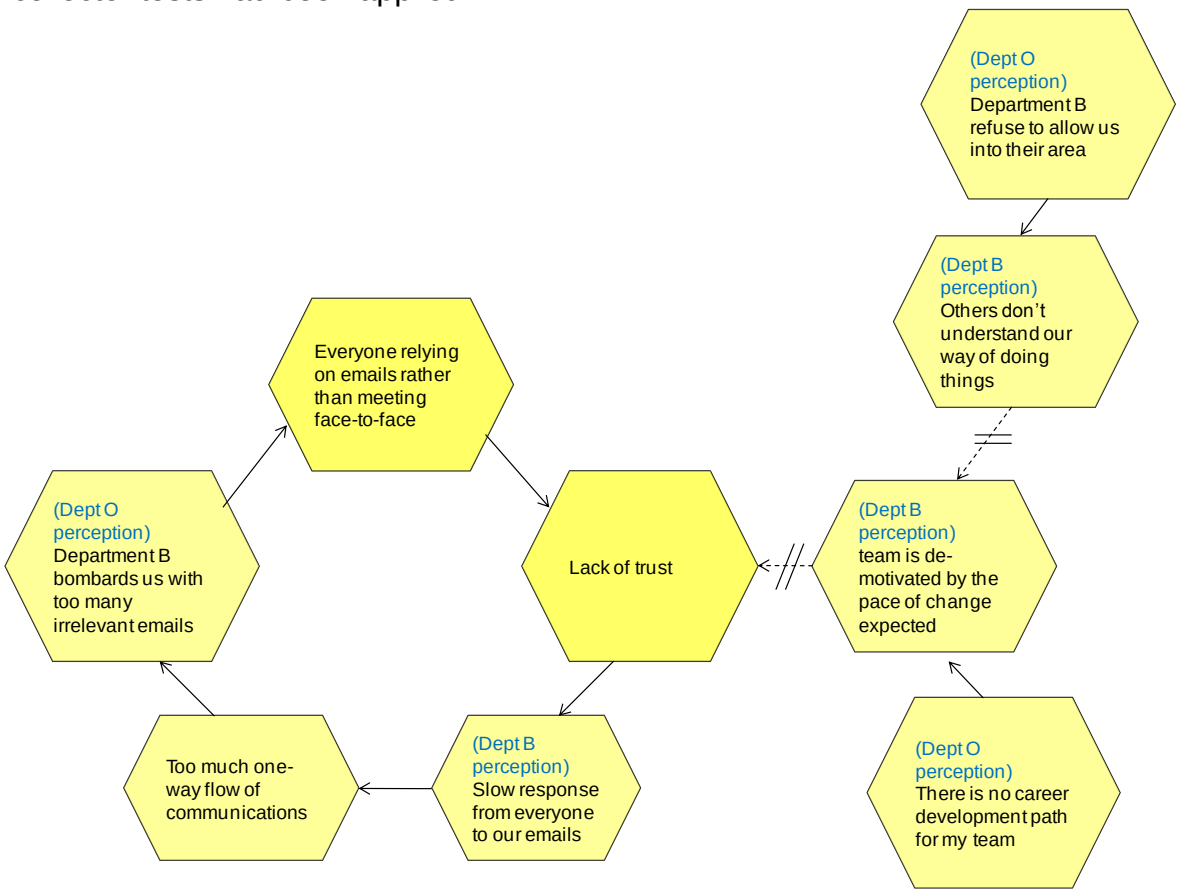


Figure 6: Perception Map – Island 2

As shown in the picture, the two most significant perceptions this time were 'lack of trust' (perception AA – loop and strongest collector) and the somewhat surprising (to me as the outsider anyway), issue of people relying on email rather than meeting (perception CC- loop and next strongest collector). The loop overall described a downward spiral in which lack of trust was leading to, what the team now revealed to be 'an avalanche of 'just-in-case'/'back-covering'' emails, which then lead to people spending more and more time checking emails, covering their own backs and feeding the lack of trust.

Figure 7 shows how this island was mapped onto the Contradiction Matrix:

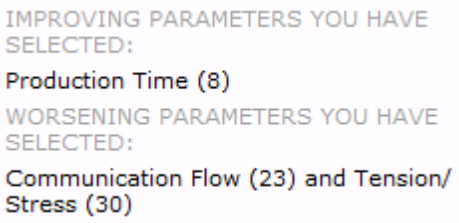


Figure 7: Trust/E-Mail Conflict Mapping

And Figure 8 shows what the Contradiction Matrix suggested:

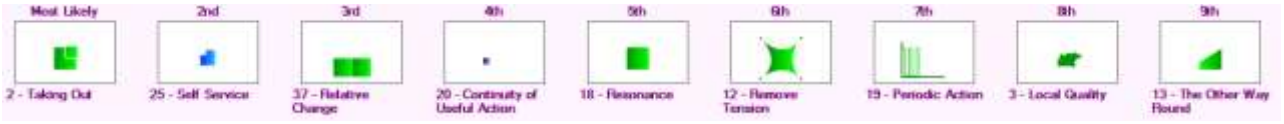


Figure 8: Trust/E-Mail Conflict – Inventive Principles Suggestions

All in all, we got to this stage after around ninety minutes in the meeting. No-one in the group had any prior exposure to TRIZ/SI, and so I didn't attempt to explain to them anything about the Matrix, simply saying that the Inventive Principles were 'strategies used by others in similar situations'.

In part 2 we'll explore what the team did with these Inventive Principles and the ones shown in Figure 5. In the meantime, perhaps you might like to explore for yourself what solution directions you would suggest to deliver win-win solutions to the problems.

Not So Funny – Construction Principles

A reader kindly forwarded a few pictures for a recent workshop on SI for the construction industry. Plenty of evidence of a hitherto undiscovered spirit of inventiveness…

…we particularly liked these examples of Inventive Principle 16, Slightly Less, Slightly More. The first from Russia... home of TRIZ…

And this one from someone with a not quite so clear grasp of the principles of Universal Design…

And how about this elegant example of Principle 7, Nesting. Again from Russia…

Here's Principle 5, Merging in action:

Principle 17, Another Dimension…

Principle 2, Taking Out…

...and finally, rather worryingly, another type of Taking Out….

SYSTEM ·ATIC INNOVAT· ION

Patent of the Month – Phase-Contrast X-Ray Imaging

We travel to MIT for our patent of the month this month. US 7,920,673, 'Phase-contrast X-Ray Imaging', was granted to inventors at the Institute on April 5. In a beautifully succinct and to-the-point invention disclosure, the inventors describe the problem they have managed to solve:

Breast cancer is the most commonly diagnosed cancer among women and the second leading cause of cancer death among females. In 2007 there will be well over 200,000 new cases of breast cancer diagnosed in the United States and approximately 40,000 women will die from metastatic breast cancer. Mammography screening has had a major impact on the rate of death. From 1950 to 1990, the death rate from breast cancer had been unchanged. In 1990, the death rate suddenly began to fall in direct relationship to the onset of widespread mammography screening that began, based on national statistics, in the mid-1980's. The death rate has decreased by 25% since 1990, and national and international data suggest that this decrease is predominantly due to early detection from screening.

A decrease in deaths of 25% is a major achievement but clearly not a complete solution to the problem. Mammography still does not find all cancers and does not find all cancers early enough to save all women. More specifically, many breast cancers have essentially the same or very similar x-ray attenuation as normal fibroglandular tissue and, as a consequence, can remain hidden on standard x-ray mammography in both digital and film/screen approaches.

Conventional x-ray imaging, as used in mammography and other applications, relies on differences in the absorption of x-rays, e.g., in bones versus soft tissue. Whether measured with film or with film-less digital methods, the fundamental limitations of absorption radiography remain with respect to tradeoffs between contrast and dose.

And there in the last sentence is a clear description of the conflict that needs to be solved. We can best map it onto the Contradiction Matrix as follows:

IMPROVING PARAMETERS YOU HAVE SELECTED:

Ability to Detect/Measure (47)

WORSENING PARAMETERS YOU HAVE SELECTED:

Harmful Emissions (30)

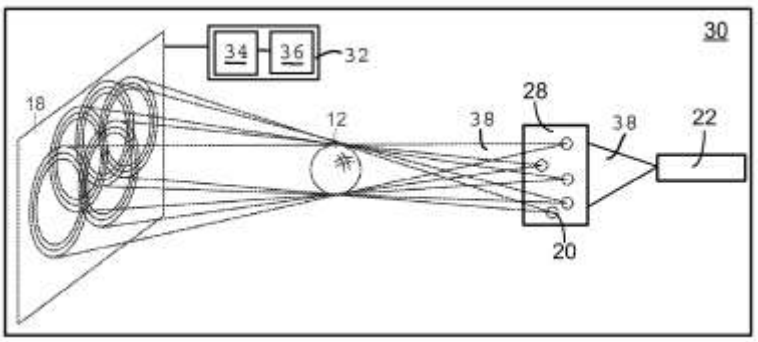
SUGGESTED INVENTIVE PRINCIPLES:

28, 2, 25, 37, 13, 35, 7, 24

And here's how the inventors resolved the conflict, as described in Claim 1 of the disclosure:

A method for phase-contrast imaging comprising: directing x-ray radiation (a) from a single radiation source through a plurality of pinhole apertures defined in a mask and (b) from the plurality of apertures in the mask through a phase object to be imaged, wherein the pinhole apertures have a span of less than 100 microns in each direction, and wherein the phase object includes a first composition and a second composition, the x-ray radiation passing through both the first and second compositions and a phase shift in the x-ray radiation being produced for x-ray radiation passing through the first composition relative to x-ray radiation passing through the second composition; detecting a phase-contrast signal of the x-ray radiation after the x-ray radiation passes through the phase object; and decoding the detected phase-contrast signal to

generate an image of the phase object, wherein the first composition is distinguishable from the second composition in the generated image.

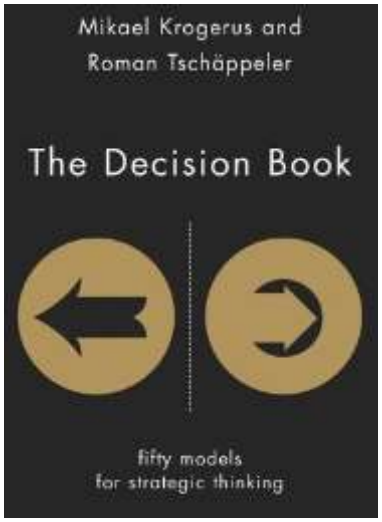


The key to the invention seems to clearly – i.e. it's in the title of the patent – lay in the 'phase-shift signal' and in turn the processing of that information to obtain a relative change between one signal and another. In that sense, the invention offers a very clear illustration of Inventive Principle 37 in its 'Relative Change' form.

At a more detailed level, the different signals are obtained using the 'mask' with its plurality of pin-holes, which, looking at the picture bears all the hallmarks of a (Principle 24) Intermediary.

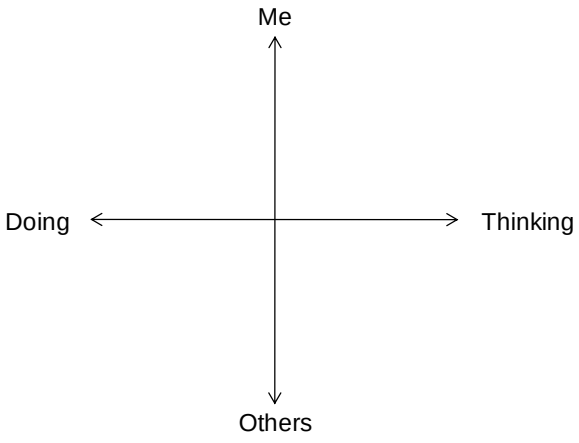
All in all a very elegant solution – taking what's already there in the system and using it to greater effect. Hopefully it serves as a good reminder of the importance of Principle 37 right now. Meanwhile, here's hoping that the solution gets its chance to properly enter the commercial world and make a real difference.

Best of the Month – The Decision Book



The Decision Book was first published in Switzerland in 2008. The English edition has just been published in the UK. It makes for an easy choice for our best of the month slot this month. The book has been a consistent best-seller amongst the business community since its initial publication, and it's easy to see why. As the title suggests, the book is all about making the right choices. Most of us face the same questions every day: What do I want? And how can I get it? How can I live more happily and work more efficiently? The Decision Book distils into a single volume the fifty best decision-making models used on MBA courses and elsewhere that will help you tackle these important questions - from the well known (the Eisenhower matrix for time management) to the less familiar but equally useful (the Swiss Cheese model).

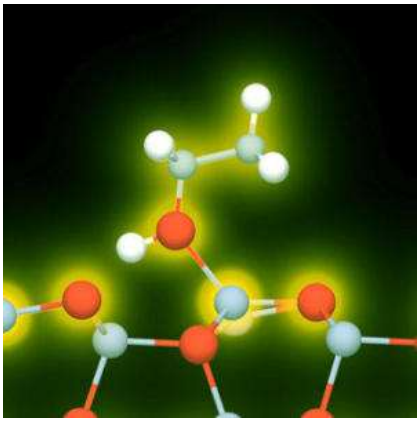
Perhaps the best part of the book, for those that wish to go beyond simply dipping in at random to one of the 50 models, the authors provide a really elegant 2x2 matrix that places each of the 50 models into a higher level meta-model. In that sense, the book represents a very TRIZ-like collation of 'someone, somewhere already solved your problem', providing as it does an elegant way of navigating through any kind of decision:



So that, if my decision is all about 'How to improve (say) members of my team' I simply head to the bottom left quadrant of the Matrix, where I find which of the 50 models is best suited to that task.

Not quite pocket-size (I don’t see why it couldn’t have been), the book is nevertheless stylish and compact. And very definitely a powerful asset. Whether you need to plot a presentation, assess someone's business idea or get to know yourself better, this unique guide will, we think, help you simplify and problem and take steps towards the right decision. Very nice… and also very cheap on various on-line book retailer websites right now. Making it, probably, the easiest decision you’ll have to make all year.

Investments – Battery-Less Chemical Detector



Here's another really neat 'self-x' solution. Unlike many conventional chemical detectors that require an external power source, Lawrence Livermore researchers have developed a self-poweered nanosensor that relies on semiconductor nanowires, rather than traditional batteries. The device overcomes the power requirement of traditional sensors and is simple, highly sensitive and can detect various molecules quickly. Its development could be the first step in making an easily deployable chemical sensor for the battlefield.

The Lab's Yinmin "Morris" Wang and colleagues Daniel Aberg, Paul Erhart, Nipun Misra, Aleksandr Noy and Alex Hamza, along with collaborators from the University of Shanghai for Science and Technology, have fabricated the first-generation battery-less detectors that use one-dimensional semiconductor nanowires.

The nanosensors take advantage of a unique interaction between chemical species and semiconductor nanowire surfaces that stimulate an electrical charge between the two ends of nanowires or between the exposed and unexposed nanowires. The group tested the battery-less sensors with different types of platforms - zinc-oxide and silicon - using ethanol solvent as a testing agent. In the zinc-oxide sensor the team found there was a change in the electric voltage between the two ends of nanowires when a small amount of ethanol was placed on the detector. "The rise of the electric signal is almost instantaneous and decays slowly as the ethanol evaporates," Wang said.

However, when the team placed a small amount of a hexane solvent on the device, little electric voltage was seen, "indicating that the nanosensor selectively responds to different types of solvent molecules."

The team used more than 15 different types of organic solvents and saw different voltages for each solvent. "This trait makes it possible for our nanosensors to detect different types of chemical species and their concentration levels," Wang said.

The response to different solvents was somewhat similar when the team tested the silicon nanosensors. However, the voltage decay as the solvent evaporated was drastically different from the zinc-oxide sensors. "The results indicate that it is possible to extend the battery-less sensing platform to randomly aligned semiconductor nanowire systems."

The team's next step is to test the sensors with more complex molecules such as those from explosives and biological systems.

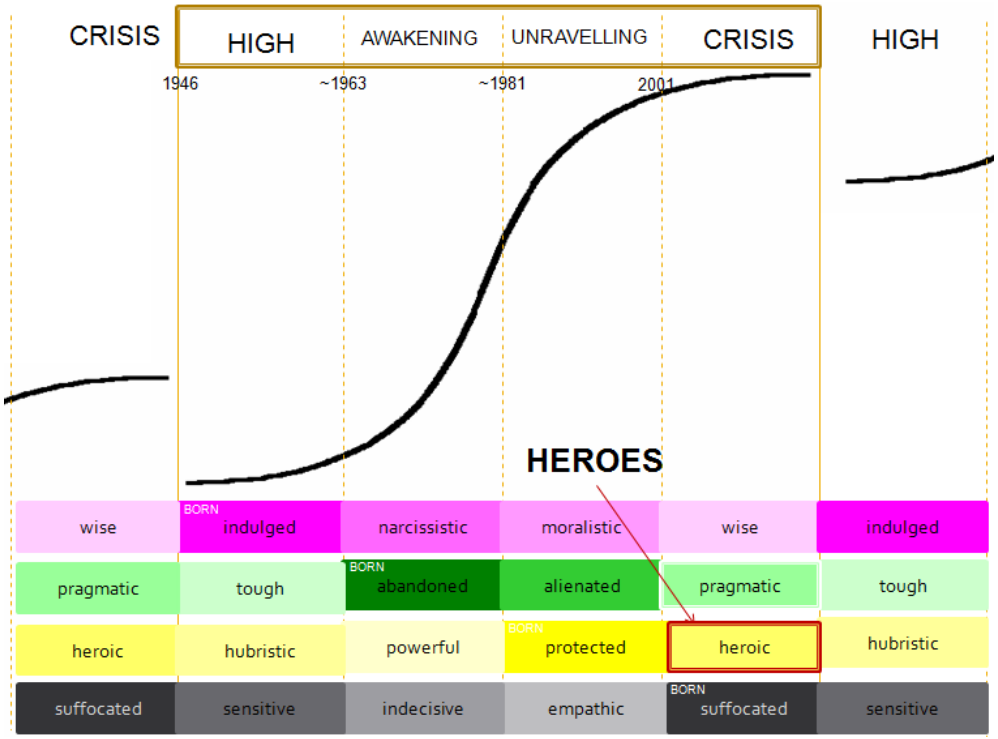
Xianying Wang, Yinmin Wang, Daniel Åberg, Paul Erhart, Nipun Misra, Aleksandr Noy, Alex V. Hamza, Junhe Yang. **Batteryless Chemical Detection with Semiconductor Nanowires**. *Advanced Materials*, 2011; 23 (1): 117 DOI

Generational Cycles – Heroic Heroes

Back in February (Issue 107) we began what will eventually become a series of sixteen Generation-related articles, each taking a closer look at each of the four main phases of the four main generational archetypes. This month is the turn of another of the archetypes found in large numbers in society at the moment: the Heroic Hero. Or, put another way, the 'grown up' Generation Y person:

		0-20	21-41	42-62	63-83
(Generation Y)	HERO	protected	heroic	hubristic	powerful
(Silent)	ARTIST	suffocated	sensitive	indecisive	empathic
(Boomer)	PROPHET	indulged	narcissistic	moralistic	wise
(Generation X)	NOMAD	abandoned	alienated	pragmatic	tough

The Heroic Hero's historical context is to spend their 21-41 age in a 'Crisis' period. In simple terms this means that they have to parent through this period and do most of the hands-on work (e.g. fighting conflicts) required to get society through the difficult times. The previous Hero generation were the 'G.I.'s' that fought the Second World War. Which is to say that if the cohort does a good job in this 'heroic' period they get to tell everyone what a great generation they are.



What this picture tells us, too, is that our Heroic Heroes spent their growing-up years being (over?) protected by their parents. They thus bring traits to their Heroic years of having been told throughout their early lives how great they are, how they can do anything and how, if things get difficult, mum or dad will help out. They're also a generation that – unlike previous Hero generations – has been raised with computers and the Internet as a constant companion.

Here, then, is a list of the general characteristics now found generally across the Heroic Hero cohort. As per our usual convention, if you're a Heroic Hero reading this, these statements don't necessarily apply to you personally (*your* character is determined by how *your* parents raised you), rather they are what may be observed when we step back and look at the cohort as a whole:

- high expectations
- disappointed with previous generations, looking to 'fix' things; not sure how
- hard working if motivated
- low persistence level if things get difficult (individually; the Hero team can be much more persistent)
- self image: "I am the best, I am different"
- prepared to take risks
- little experience with failure (and often bailed out by parents when things go wrong)
- if successful: I'm the hero
- if not: it wasn't my fault and I want somebody to blame
- open-minded
- team-oriented (still in touch with high proportion of school/college friends)
- flexible and creative
- brand conscious
- open for technical innovations, but usually at a user level rather than detail
- no learning curve, impatient
- love positive feedback
- networker (XING, alumni etc.)
- follow sense
- work to live/work-life balance very important
- don't love routines because no chance to be a hero

Particularly useful Hero archetypes are Alex Turner of the band Arctic Monkeys and Lilly Allen (of album, 'It's Not Me, It's You' fame), both very clear 'Heroic Heroes'.

Key things to notice: Alex's disheveled appearance and generally confused expression; Lilly's 'little-madam' expression.

Key Contradictions:

1) Think I can do anything versus can't do very much at all… especially if it involves anything practical
2) Passionate desire to change a (failing) world; massively frustrated by the current systems (see the overthrow of the government in Egypt and other Middle Eastern countries)

Relationships With Others:
The following table is all about how the Heroes see others around them. As per the convention determined in the February article, we have divided the relationship story into two main dimensions: 1) how the Heroes see the four different Prophet, Nomad, Hero, Artist types, and 2) how they view the people inside their friends and family network versus how they view those outside.

	Prophets	Nomads	Heroes	Artists
Outside Friends/ Family Group	Rich Powerful Power-grabbing/refusal to let go Dis-interested Self-serving Consequence avoiding Distant 'Crocodile Smiles' Property owners	Self-interested Some powerful; some overly passive Responsible Don't see bigger picture Mortgaged Approachable but selectively deaf Riding on prophets coat-tails Untrustworthy (especially politicians)	(peers) Self-interested Mislead, but now wise Passive/Prozac Irresponsible Leaderless Facebook protests Very open - don't understand privacy Everything to extremes (binge-drinking, etc) Information is free Debt ('will never have a home')	(older grandparents) Dis-interested Different world Powerless (children) Prizes for all Pink girls/Blue boys Insular Dominated by parents Society leading them in the wrong direction
Inside Friends/ Family Group	(late-parents/grandparents) Well-off Secure Lost when retired Not trying to make a difference Dis-interested grand-parents	(parents) Acting within small sphere 'Given up' – possibly trying to make a small difference, not the world A friend rather than a parent	(siblings/friends) Honest Trustworthy Unrealistic Materialistic Strong sense of right and wrong 'We're in this together' – want to change the world; not sure what to	(offspring) Dangerous world/ very protective Worried for their future Know discipline is needed/not sure how to administer Educational toys

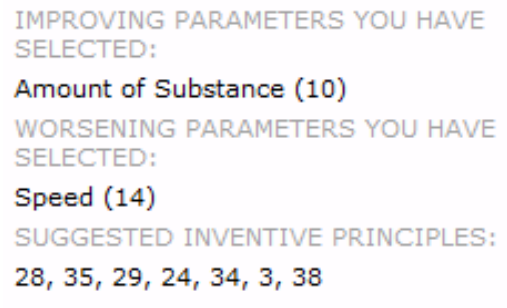
Biology – Frogfish

Frogfish eat crustaceans, other fish, and even each other. The manner by which they catch their prey represents another record-breaking solution within the animal kingdom. When potential prey is first spotted, the frogfish follows it with its eyes. Then, when it approaches within roughly seven body-lengths, the frogfish begins to move its illicium in such a way that the esca mimics the motions of the animal it resembles. As the prey approaches, the frogfish will slowly move itself to prepare for its attack; sometimes this involves approaching the prey or "stalking" while sometimes it is simply adjusting its mouth angle. The catch itself is made by the sudden opening of the jaws, which enlarges the volume of the mouth cavity up to twelve-fold, pulling the prey into the mouth along with water. The attack can be as fast as 6 milliseconds, which makes it the fastest "gape and suck" of any fish. The water flows out through the gills, while the prey is swallowed and the esophagus closed with a special muscle to keep the victim from escaping. In addition to expanding their mouths, frogfish can also expand their stomachs to swallow animals up to twice their size.

Slow-motion filming has shown that the six millisecond attack is so fast that other animals can't see it happen. This is less time than it takes a muscle to contract so the source of the motion remains unknown.

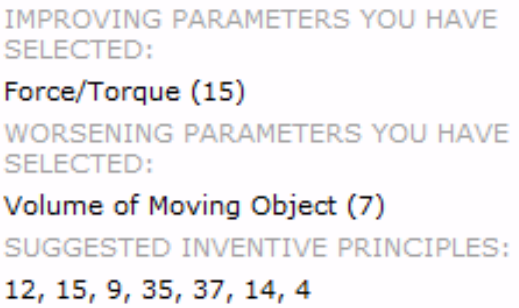
From a contradiction elimination point of view, at its highest level, the basic problem being solved by the rapid suction solution is the fight between the need to capture prey and

being able to do it fast enough that they don't have the opportunity to escape. Here's what that conflict pair looks like when mapped onto the Contradiction Matrix:



While the frogfish has thus far failed to evolve a 'field'-based solution to the prey capture problem (Principle 28, Mechanics Substitution), it has very successfully managed to mature a fluid one, Principle 29.

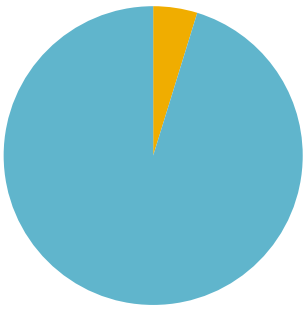
Having 'determined' that fluids was a good direction (certainly plenty of fluid resources nearby!), the next problem down the hierarchy is how to generate enough force to suck in the (potentially heavy) prey with a limited body size. Here is what that conflict looks like on the Matrix:



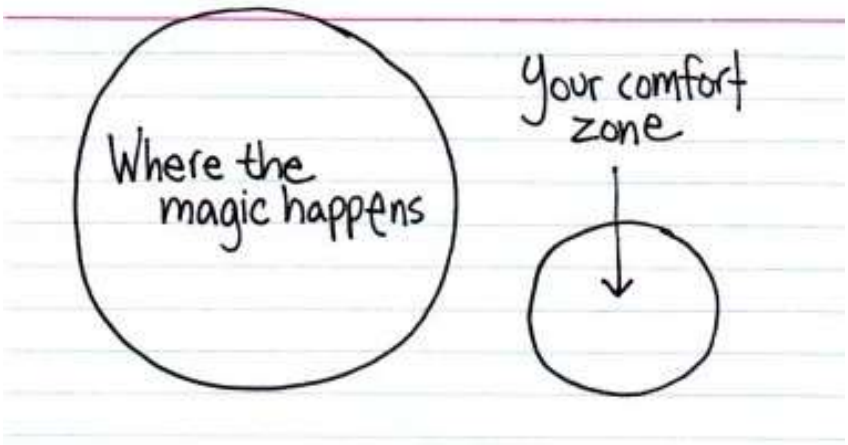
And again, the solution evolved in the frogfish offers a clear illustration of one of the recommendations, this time Principle 15, Dynamics.

We also suspect, although difficult to know for sure since the zoology community doesn't appear to have unraveled the mystery yet, that Principle 37, Relative Change is in evidence in terms of controlling the water flow out of the gills and the 'special muscle' closing the esophagus. And more likely than not, Principle 12, Equi-potentiality has more than a little to say about the 'how to contract the muscles fast enough' mystery…. Perhaps this time, we get to help the zoologists solve their problem rather than using their hard work to give us illustrations of how to use the Matrix? Stranger things have happened.

Short Thort



We typically use 5% of our brain's capacity.
The other 95% is subconsciously working
to keep you inside your comfort zone



News

ICSI Shanghai
In addition to presenting a pair of papers at the second International Conference on Systematic Innovation, we will also be giving a half-day SI-Basic workshop on the afternoon of May 28. The conference itself runs from the 26th. Details and registration at the ICSI conference website.

NHS Keynote
We will be presenting a short keynote address, 'Innovation: The Systematic Approach' at the annual South West Annual Medical Physics and Clinical Engineering Scientific Meeting being held at the Plymouth Hospitals NHS Trust on 14 May.

Innovation Blog
In the run up to the big 9 May 'Innovate To Success' event in London, we are producing a special series of blog articles. Each of the articles focuses on a different aspect of the 'why is innovation seemingly so difficult?' quandary. The first four have already been posted at the time of writing; the next four will most likely be live by the time you read this. Find them all at the 'Innovate To Success' website.

New Projects

This month's new projects from around the Network:

- Automotive – innovation capability benchmarking/senior management workshop
- Government – SME engagement strategy project
- FMCG – IP generation project
- Automotive – problem solving consulting project
- Industrial – problem solving clinic workshops
- FMCG – Eyes on the World
- Government – SI distance learning package