Subscription 0080

Systematic Innovation

e-zine

Issue 9, October 2002

In this month's issue:

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

Our guarantee to the subscriber is that the material featured in the e-zine will not be published elsewhere for a period of at least 6 months after a new issue is released.

Readers' comments and inputs are always welcome.
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Un-Natural Creativity

Introduction

TRIZ is often criticized by the 'traditional' creativity education industry for being too prescriptive, too systematic, and too left-brained in its approach. Alongside these criticisms is an – often unspoken – parallel perception that creativity cannot feasibly or practicably be a systematic thing. This article makes an attempt to set the record straight. In true TRIZ fashion, the main theme of the article is that it should not be a case of one school of thought versus another, but rather how can the two forms complement one another.

'Unblocking'

The very large proportion of conventional creativity education shares a set of common features. These are:

1) people are 'bad' at being creative because the environment in which they have been educated and work tends to destroy our natural instincts,
2) in order to make people 'more' creative it is necessary to remove the barriers and blockages that have caused those natural instincts to be squashed,
3) the best way to do this is to encourage people to do strange things like banging drums, painting pictures, putting their clothes on backwards (on one particularly distressing course one of us has been forced to attend in the past).

An awful lot of research into creativity has realized very little in terms of tangible, usable output. One thing that all appear to agree on is that our education system and our working environment do much to destroy our creative instincts. Figure 1 illustrates a typical description of level of creativity versus our age.

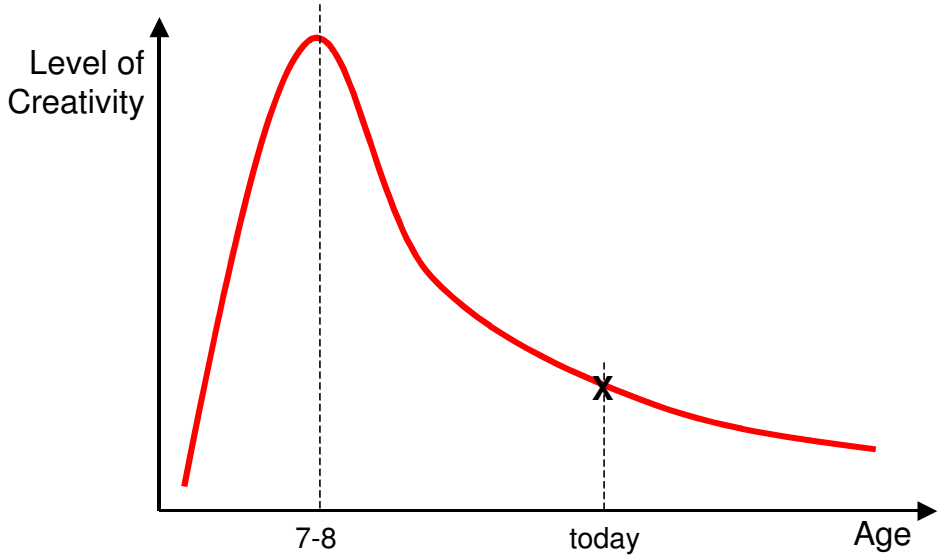


Figure 1: Natural Creativity versus Age for a Typical Person

As a consequence of this characteristic, creativity education is predominantly focused at 'unblocking' or removing the things that have, over time, caused our innate levels of creativity to decline – Figure 2. The older we get, the graph suggests, the lower our level

of creativity will become. Unfortunately, as we get older, we are also less likely to take kindly to someone telling us to bang a drum or put our clothes on back to front.

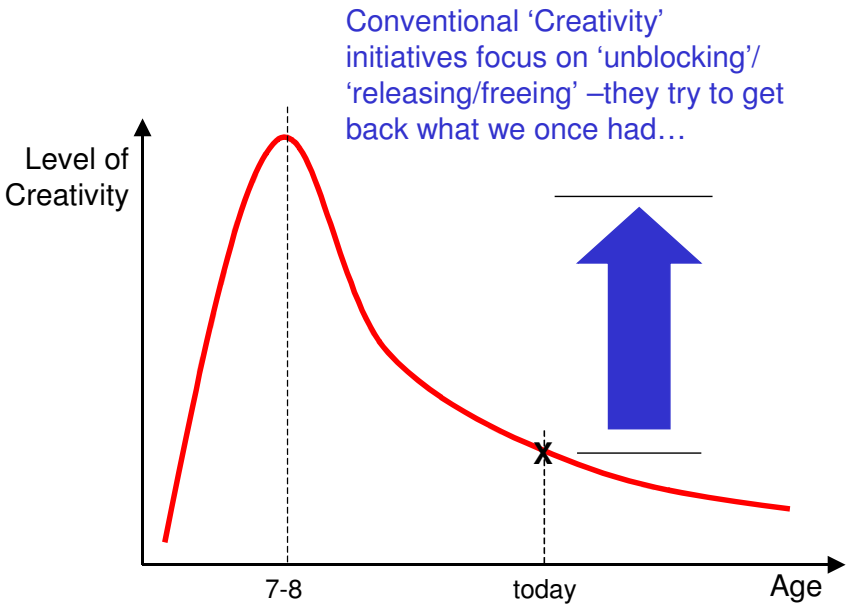


Figure 2: Conventional Creativity Education is About 'Unblocking'

As far as 'conventional' creativity training and education is concerned, once we have 'unblocked' people, the job is largely complete.

Unfortunately, this assumption is incorrect. In actual fact, it is very often not only incorrect but positively dangerous. It is an assumption that usually results in the following sequence of events following this kind of creativity education:-

1) Euphoria Stage – everyone had a great time (except if they were asked to put their clothes on back to front!), and is fired up ready to 'do things differently' when they get back to their desk.
2) Errr? Stage – the new mindset is brought face to face with a real problem or opportunity situation; the brain finds it very difficult to connect what has just been learned with the situation being faced. The newly 'unblocked' mind perseveres for a while, but struggles to make any really useful connections.
3) Same Old Same Old Stage – having ultimately failed to connect the creativity education to the situation, the brain suggests that perhaps the old ways of doing things will be better after all. This stage usually occurs within about a week of completing the unblocking training.

Although it might not sound like it, this description is not intended to be a criticism of the 'creativity is about unblocking' school of thought, but merely a means of pointing out the crucial missing element from the foundations assumed by traditional methods, namely that our 'natural' levels of creativity are rarely sufficient. If they were, an eight year old could solve the real work problems we are expected to solve. As described by Edward de Bono:

"The purpose of the brain is to enable us to survive and to cope. The purpose of the brain is not to be creative. Cutting across established patterns to produce new ideas is not what the brain is designed to do." (1)

In other words, even if the eight year old were sufficiently armed with all of the facts concerning the problem being tackled, they still would not be sufficient to enable them to solve it. This has nothing to do with their lack of inhibitions. Sometimes, very simply, we need some '*un-natural'* creativity.

Un-Natural Creativity

Un-natural creativity is the stuff that is simply not present in our brain to be 'unblocked'. As illustrated in Figure 3, it is stuff that is different from our natural creative instincts. In simple terms, it takes two forms:

a) Unknown Knowledge – if we have never heard of the Coanda Effect as a means of moving air or separating solid things from air, then we could spend from now to eternity trying to 'unblock ' our brains and still not come up with it as the answer to a problem. Being able to access new knowledge like this is one of the reasons the TRIZ-based functionally classified knowledge databases are important.

b) Unknown Strategies – 'thinking out of the box' does not come naturally. A quoted from Dr deBono, our brains are designed to find patterns and stick to them. Breaking out of established patterns requires specific actions to be taken. The TRIZ Inventive Principles, Trends of Evolution, Standard Solutions and psychological inertia tools like Smart Little People, Nine Windows and Size-Time-Interface-Cost models are designed to offer not just systematic strategies for getting out of the box, but also to get us to places that we can be pretty certain are good places.

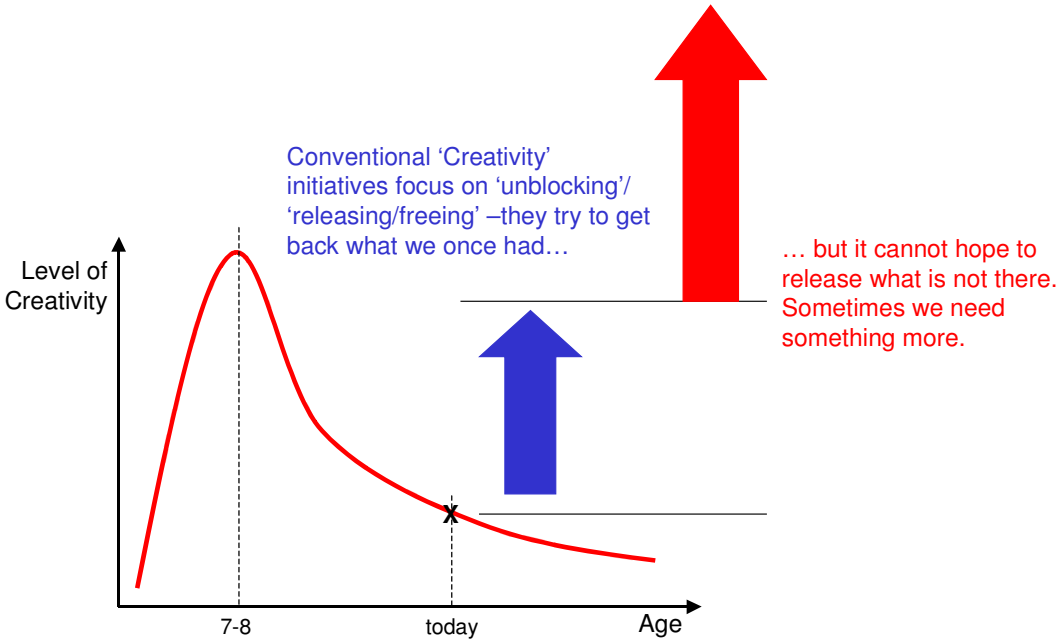
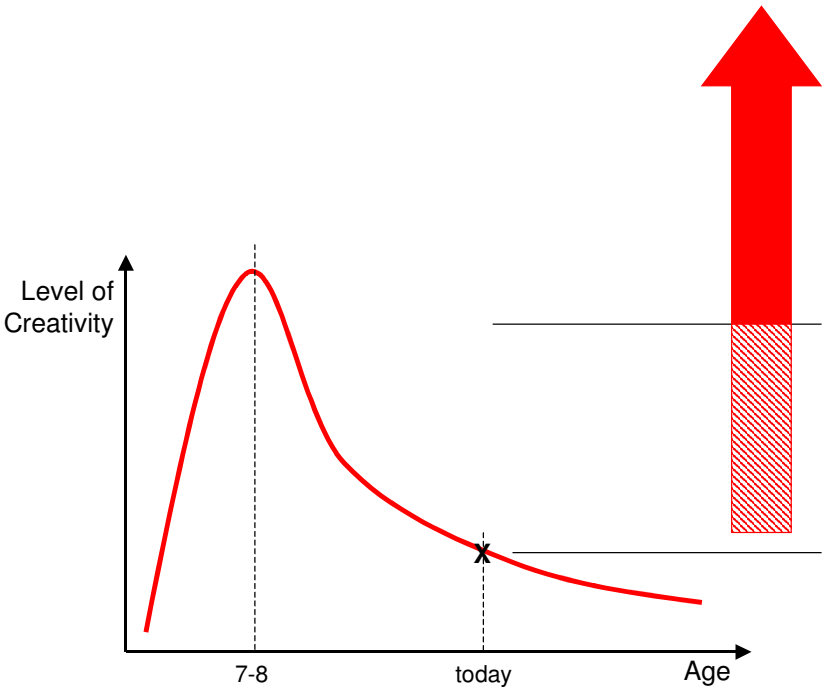


Figure 3: No Amount of 'Unblocking' Will Release Knowledge That Isn't Present

Unblocking AND Un-Natural

Again, the argument is not that this kind of 'un-natural' (but, in TRIZ terms, 'systematically achievable') creativity is a replacement for the unblocking method. This kind of 'systematic

creativity' on its own is also often insufficient. The commonly cited argument that 'all that is required is sufficient logic and the problem will be solved' represents one important part of this. To quote again from Dr deBono, '…*any valuable creative idea will be perfectly logical – and even obvious – in hindsight, so that the receiver of the new idea will claim that a little bit of logical thinking would have reached the idea without all that 'messing about*'. Or, to quote from one of our critical customers 'any good engineer would have known about that' (even though probably only four engineers in the whole world actually knew about the solution we had just proposed). This 'logic is all that is required' belief represents one extreme end of the creativity spectrum. Becoming more creative by putting your clothes on back to front represents the other extreme. Again, to re-iterate, its not about one end versus the other, but being able to combine the two. It is about achieving the state



suggested in Figure 4.

Figure 4: Un-Blocked AND Un-Natural Creativity

To offer a specific example; it is not just about discovering that the Coanda Effect can solve a problem for us, but a whole host of other things like getting people to buy into the idea, deploying the idea in inventive and novel ways (particularly if someone has patented the solution we would like to use).

Strategy A or B may get us to the solution, but 'A **and** B' will beat 'A or B' just about every time.

References

1) DeBono, E., 'Serious Creativity', Harper Collins, 1992.

Conical Spirals

Those of you that have read Professor Linde's paper from TRIZCON this year, or know about WOIS will be aware of the beautiful spiral evolution pattern analogy. We've been using a modified version of this analogy alongside our evolution-towards-ideal-final-result cone model. The result is an image we have begun using a lot during courses and presentations. The image is illustrated in Figure 1 below. For those interested, one of the papers we will present at the TRIZ Future conference in Strasbourg next month

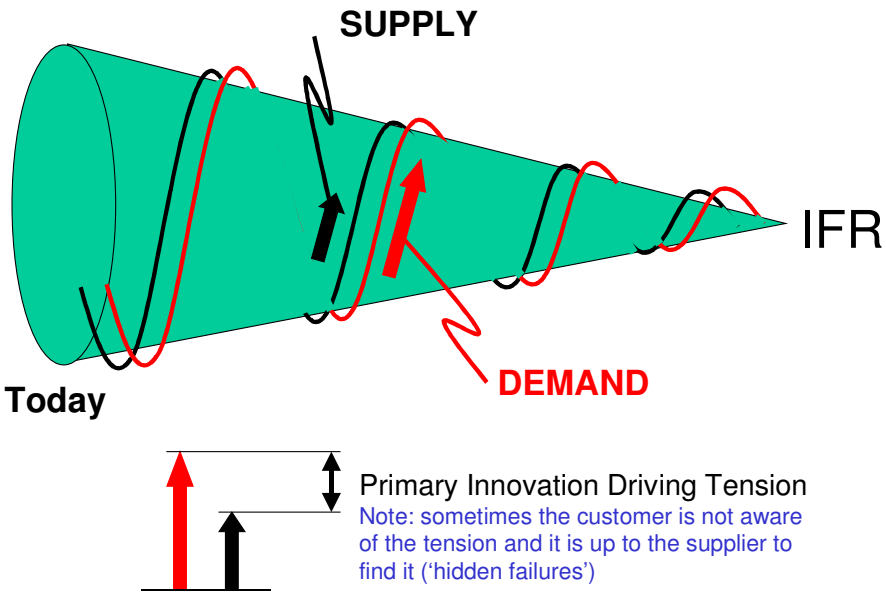


Figure 1: Evolution as Conical Spiral (from (1))

The basic underlying concept behind the spiral involves the two evolution lines described generically as 'supply' and 'demand', and the fact that it is the tension created by differences between these two that provides the need for innovation.

One of the images related to this conical spiral that we weren't able to explore during the paper was the importance of the 'ever-decreasing circles' perspective obtained when viewing the cone from the left of the picture – Figure 2.

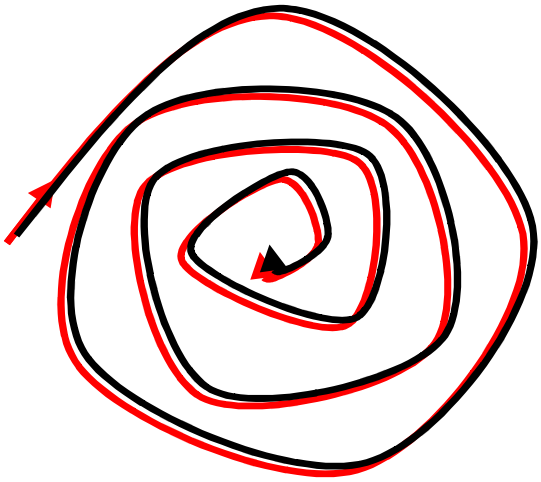


Figure 2: Conical Spiral – View From Base

The (we think) useful image that connects to this spiral image comes when we connect the circularity idea with the evolution trend that describes how systems evolve through repeating cycles of increasing followed by decreasing complexity – Figure 3.

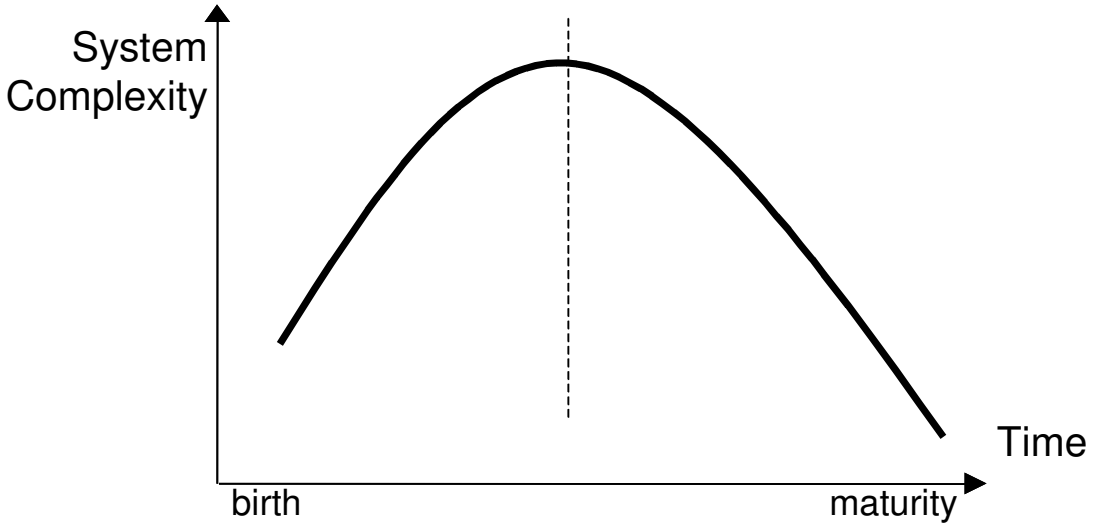


Figure 3: Increasing Followed By Decreasing Complexity Trend of System Evolution

The result if this connection is the image illustrated in Figure 4. Very simply, the figure suggests that if we assume that one complete revolution of the cone represents one s-curve, then as systems evolve (travel along their spiral evolution path) the circle they describe accurately reflects the repeating increasing-decreasing complexity trend.

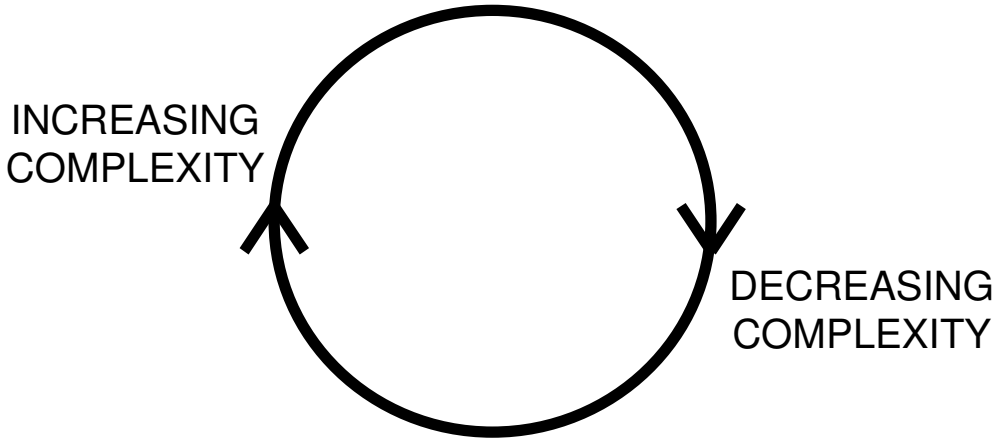


Figure 4: Correlation Between Circularity and System Complexity Evolution Characteristic

If we further suggest that the diameter of the described circle is correlated to the range of complexity, the additional implication suggested by the fact that the spiral evolution trajectory is convergent is that as new s-curves (new circles) emerge and head the system towards the ideal final result, the range and/or level of complexity in each successive s-curve progressively reduces. With the proviso that there are a number of implications when we also include recursion and system hierarchy effects, we believe the suggested correlation, although simplistic is actually both valid and useful.

References

1) Mann, D.L., Dewulf, S., 'Evolutionary Potential in Technical and Business Systems – The Next Stage', paper to be presented at TRIZ Future 2002, Strasbourg, November 2002.

Extracting Patterns From the Contradiction Matrix

We are often asked why the parameters in the classic TRIZ Contradiction Matrix are sequenced in the way that they are, and whether there is any underlying logic. Our favourite answer to the question comes from a training company who once tried to convince their course delegates that the sequence came about simply because that was the Russian language alphabetical order. We'll leave you to ponder the logic behind that suggestion. Or maybe we should just say that the name of the originator will be supplied if anyone is interested in exploring the idea further.

Meanwhile, the logic we have interpreted from the Matrix parameter sequence is that they describe the general progression illustrated in Figure 1.

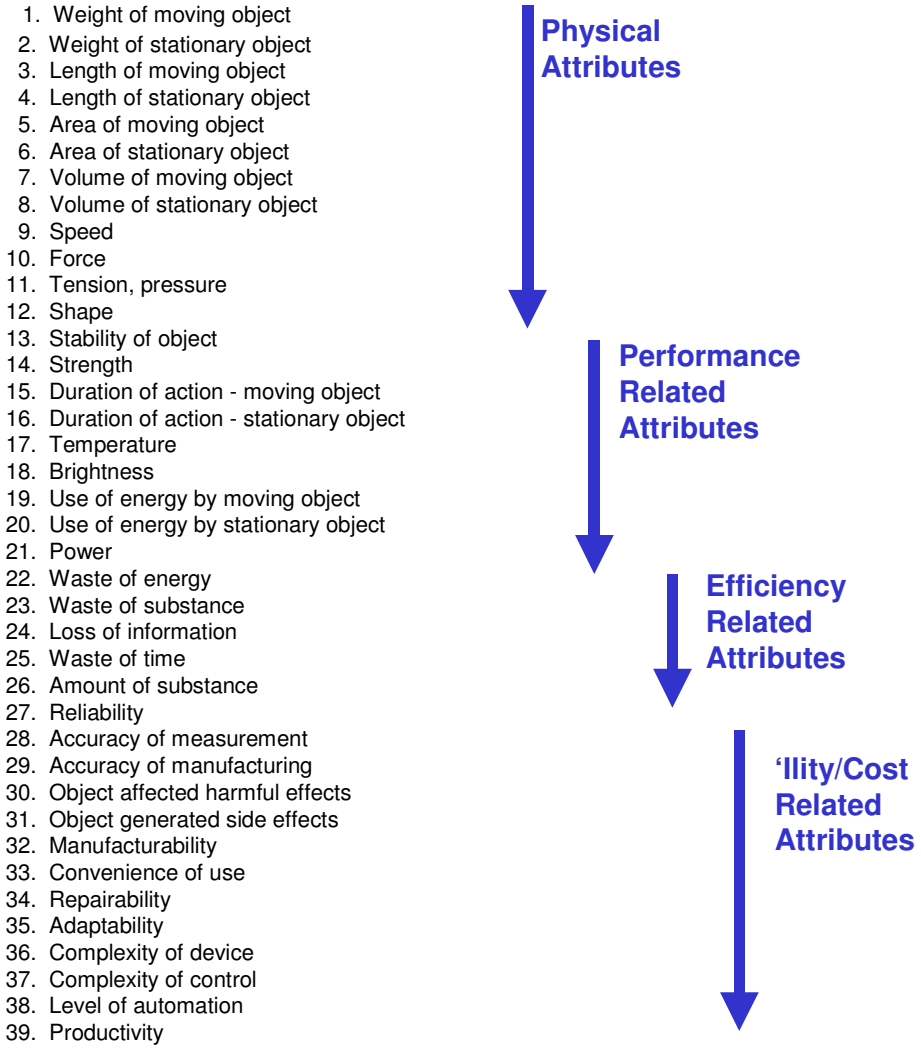


Figure 1: The Shifting Focus of Contradiction Matrix Parameters

Whilst the progression is not absolutely precise, it is nevertheless good enough to allow us to do two useful things with it. The first is that we can correlate the Matrix structure to the shifting focus that designers and engineers have as a system evolves along its s-curve. Figure 2 is a picture we use regularly to demonstrate how this progression can be used to help identify where a system is on its s-curve. For the purposes of this article it is sufficient

to register that the sequence illustrated in Figure 1 and that described in Figure 2 are very similar.

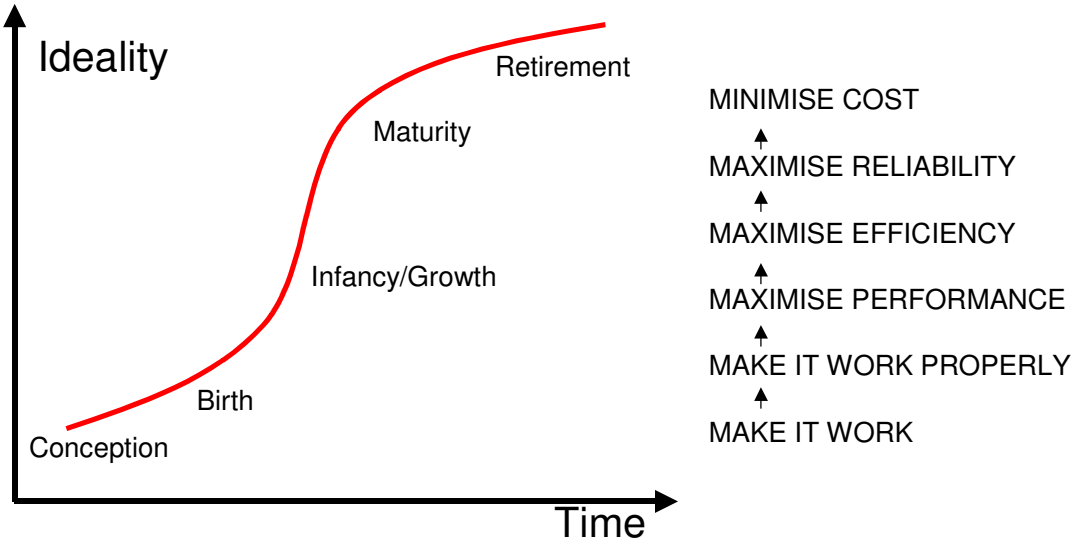


Figure 2: Correlation Between Invention Focus and Position on S-Curve

The consequence of this correlation is that as systems evolve, the focus of the contradictions that are tackled by inventors will shift to different regions of the Contradiction Matrix. In simple terms, the correlation between system maturity and area of the Matrix most likely to be useful may then be drawn in the manner shown in Figure 3.

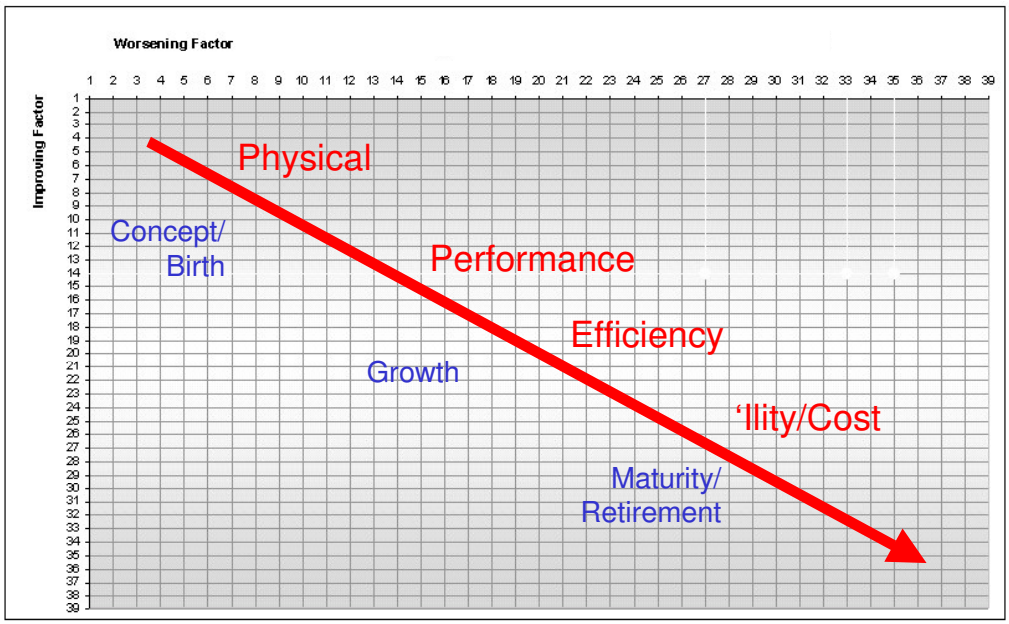
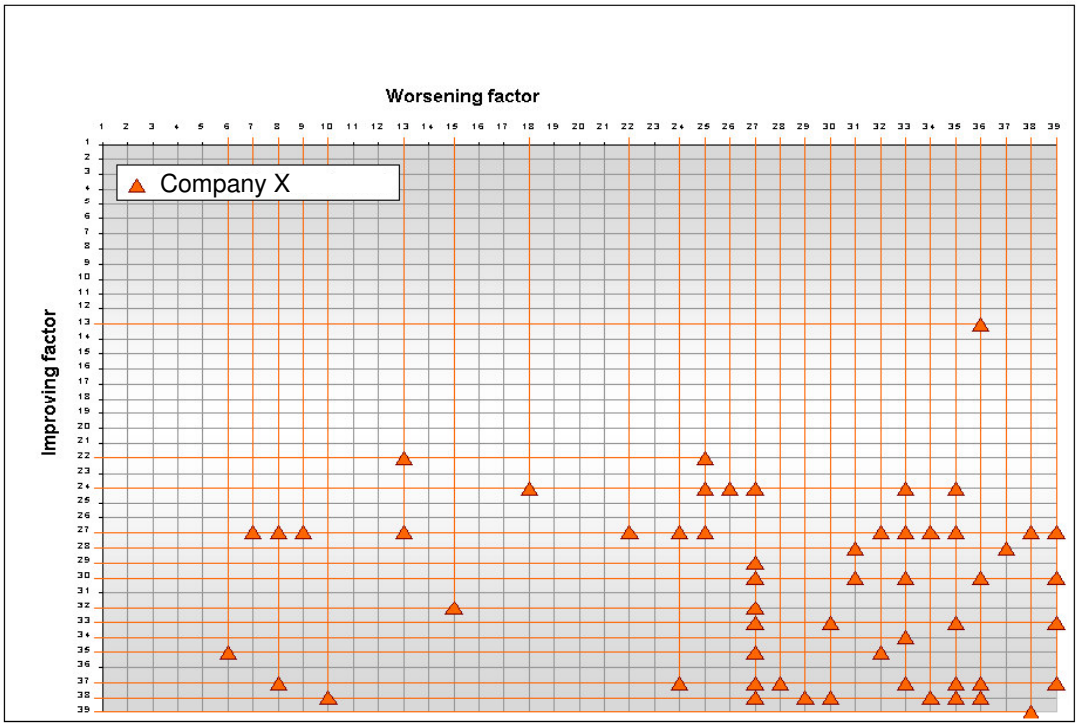


Figure 3: Correlation Between Contradiction Matrix Focus and Position on S-Curve

The second useful thing we are now able to do once we have realized this general correlation between position on the Matrix and maturity of the system comes when we relate this characteristic to the work the CREAX research team is doing examining patents. Any of our readers that have been involved or seen some of the work our team is doing will be familiar with the pictures we construct to show which contradictions a system or company or industry is predominantly tackling over a given period of time. Figure 4 illustrates a plot that we produced when looking at the 50 most recent patents for a

particular company in a particular field. The main function of this type of plot has thus far been to derive correlations between what Inventive Principles companies are using relative to what the Matrix recommends, and what Principles are available. The picture that also now emerges when we link this picture to the pattern illustrated in Figure 3



means we can show where that system, company or industry is on its current s-curve.

Figure 4: Typical Contradiction Focus Snapshot
(each triangle indicates an invention challenging a given contradiction)

This picture (which is an actual one) clearly suggested to the organization in question that just about all of its inventive focus was on gathering the last remnants of possible improvement from a system that was approaching the end of its potential.

This type of figure is intended to be used merely as a snapshot look. In this role, we think it offers useful information in a neatly digestible picture. A snapshot, of course, should not be confused with or seen as a substitute for a proper analysis.

Humour – Conference Report – Design Research Society (DRS) 'Common Ground' Conference – Brunel University, 5-7 September.

'Suffering the conference circuit so you don't have to.'

We presented a paper at the above DRS conference – an updated version of the methods integration paper we published in TRIZ Journal earlier this year – but our main aim of attending the conference was to try and build a few bridges between the world's of engineering and that of design. Unexpectedly, we managed to combine the conference report we would have written anyway with the need to write something on the subject of humour. We say 'unexpectedly' because even though it seems that the overall quality of papers at conferences is not what it was, say, five years ago, we really didn't expect anything like our experience at this conference – which is after all supposed to be the world's leading edge when it comes to design research, and which had managed to attract close to 150 delegates from literally all corners of the world.

The image that comes vividly to mind is the Crimson Permanent Assurance scene from Monty Python's film 'The Meaning of Life' -

CHAIRMAN: ...Which brings us once again to the urgent realisation of just how much there is still left to own. Item six on the agenda: the meaning of life. Now, uh, Harry, you've had some thoughts on this.
HARRY: That's right. Yeah, I've had a team working on this over the past few weeks, and, uh, what we've come up with can be reduced to two fundamental concepts. One: people are not wearing enough hats. Two: matter is energy. In the universe, there are many energy fields which we cannot normally perceive. Some energies have a spiritual source which act upon a person's soul. However, this soul does not exist ab initio, as orthodox Christianity teaches. It has to be brought into existence by a process of guided self-observation. However, this is rarely achieved, owing to man's unique ability to be distracted from spiritual matters by everyday trivia.
[pause]
BERT: What was that about hats, again?
HARRY: Oh, uh, people aren't wearing enough.
CHAIRMAN: Is this true?
EDMUND: Certainly. Hat sales have increased, but not pari passu, as our research initially--
BERT: But when you say 'enough', enough for what purpose?
GUNTHER: Can I just ask, with reference to your second point, when you say souls don't develop because people become distracted,...
[rumble]
...has anyone noticed that building there before?

DRS Common Ground had an awful lot with a focus on hats. Or rather, confusing the surplus details with the important stuff.

The seeds of our dismay were firmly planted during an early session labeled 'Philosophy'. Essentially a collection of papers written by authors, each advocating one my-way-or-no-way mode of thinking over an other, with no-one really attempting to understand the perspectives of anyone else, and certainly no-one choosing to venture outside the boundaries of the world they knew as 'design'. Nevertheless, in the true TRIZ spirit of resources and 'even the bad stuff is good stuff', we spent the time available during the gaps where no-one was saying anything remotely interesting deriving our own method of assessing, when there are a series of parallel sessions taking place, which papers to go and listen to and which to avoid.

The first thing we need to do during the selection process is find out a little bit of information to enable us to classify papers into one of four basic categories:-

Category 1 – I'm a Masters/PhD student, I don't really understand what's happening in this project or what it's for, but my supervisor should write a paper to help me get my qualification.

Category 2 – I'm an academic with a paper quota to meet.

Category 3 – I'm 'in industry'. My paper is actually an advertisement for my product/service, but I'll disguise the fact slightly.

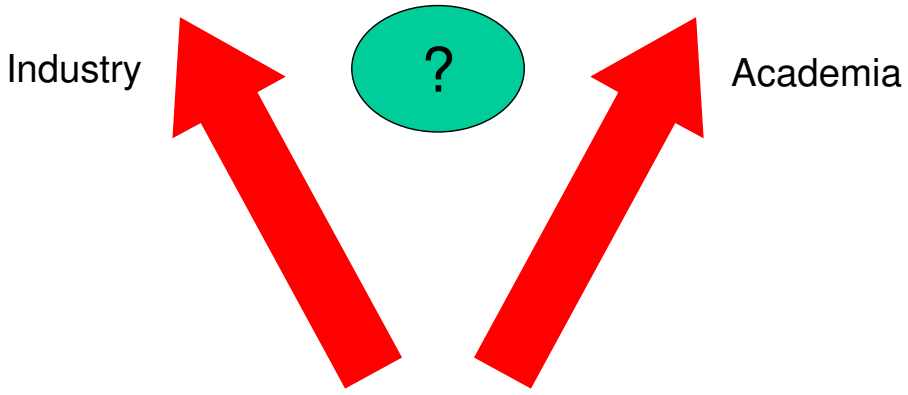
Category 4 – I'm really interested in my subject, I think it is valuable, think I am doing some important work, and I would like to convey that importance to the audience.

Needless to say, only one of these categories is worthy of your valuable time and energy. Our experience suggests that a prior read of the conference abstracts offers a pretty reliable indication which category a particular paper is going to be present in. There is probably also a worthy correlation between some of these categories and the TRIZ Levels of Invention – firstly in terms of the percentage of papers in each category, and secondly in that a good Category 4 paper will usually end up spawning a whole series of other category pale imitations at future conferences. The possible exception to the level of invention rule comes with a quality/content paradox: This paradox relates to the fact that the first three categories of paper are as if not more likely to be presented well (there is little content and so all that is left is to make the thing look and sound nice); the Category 4 presenter is often actually likely to have poor slides, speak for too long and disappear off on lots of interesting tangents.

The DRS conference appeared to buck the trend a little by featuring – as far as we could tell (and we realize we may be doing one or two authors a major dis-service here as we couldn't hope to see all of the papers) there were only two (out of about 140 papers) in the fourth Category level. One of those is discussed elsewhere in the newsletter.

Now, while all this might seem a little bit too cynical (putting this review in the section marked 'humour' probably didn't help – sorry!), there are actually a number of serious points to be made here. Namely:-

1) The growing gap between industry and academia was as evident at the DRS conference as we've noticed at other conferences of a similar theme and background recently. This is actually becoming a serious problem in several areas – with industry heading inexorably towards ever shorter-and shorter term thinking, and academia not only refusing to join them, but, more seriously, reacting in a manner that is seeing it veer further and further in a detached blue-sky direction. Not that either need be bad per se – in fact both can be justified at a certain non-holistic level – merely that the growing gap will ultimately hinder the progress of both.



2) In this day and age of almost infinite access to knowledge, it is becoming wholly unacceptable for researchers and authors to fail to search the state of their art. On far too many occasions at the conference we find ourselves thinking that we knew about something that existed that had already solved a problem being discussed by

an author, but even though they were supposed to be working at the frontiers of their field, they knew nothing about. Credibility in the information age demands that authors know what is going on around them. This is not to say that someone researching ‘domain independent design methods’ should be an expert in TRIZ or Axiomatic Design or QFD or any other method, but, for goodness sake, they should at least have heard of them.

Patent of the Month

The patent of the month honour this month goes to Bosch for US6,446,024 granted on September 3:

United States Patent **6,446,024**
Leimbach , et al. **September 3, 2002**

Process and device for determining a vehicle's mass

Abstract

A mass value is determined which represents the mass of a vehicle. The vehicle includes a drive unit and a clutch unit. By the disengagement of the clutch unit, the force flow between the drive unit and the vehicle wheels can be essentially interrupted. At least a first acceleration value is detected which represents the vehicle acceleration at a first time point. Furthermore, at least a first drive value is detected which represents the drive force or the drive torque of the drive unit at the first time point. At least a second acceleration value is detected which represents the vehicle acceleration at a second time point whereat the clutch unit is disengaged. A comparison then takes place of the detected second acceleration value with at least one pregivable threshold value. The determination of the mass value takes place at least in dependence upon the comparison and at least in dependence upon the detected first acceleration value and the detected first drive value.

Inventors: **Leimbach; Klaus-Dieter** (Moglingen, DE); **Veil; Hans** (Eberdingen, DE); **Hummel; Stefan** (Stuttgart, DE)

Assignee: **Robert Bosch GmbH** (Stuttgart, DE)

The patent struck an immediate chord with us since we were once asked a very similar question by an aerospace company looking to solve the problem of accurately measuring the weight of a flying aircraft.

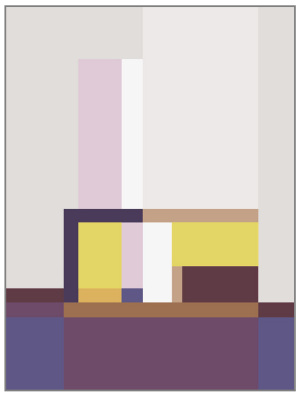
Our suggested solution came from the Inventive Standards. Those of you familiar with the Standard will know there is a special class of solutions specific to measurement type problems – see page 246 of the Hands-On book, for examples. The suggestion we came up with for the aircraft problem used Standard 4.1.3:

“Transform the problem into one involving successive measurement of changes”

In other words, the Standard suggests using the time between measurements as a resource. As it happens, the solution we suggested for the aerospace problem was rejected. As it happens, also, the Bosch patent uses exactly the strategy we recommended. Oh well! Never mind – at least it offers a very neat example of Standard 4.1.3 in action.

Best of the Month

Our favourite read of the month this month came at the Design Research Society conference held at Brunel University (see review elsewhere in this edition of the newsletter). The paper in question was 'Meaning and Preference of Color Palettes Among Four Cultures' by Youngsoon Park, Jiyoung Yoon and Denise Guerin. Their paper concerns the significance of colour in the design process, and in particular the different cultural perspectives that influence what colour combinations we do and don't like. Colour is present in TRIZ mainly through Inventive Principle 32, but even here it's importance is often largely ignored. It is our hope to be able to present more on this subject in future papers and articles – either here or in TRIZ Journal. Meanwhile, with the kind permission of Professor Youngsoon Park, we invite readers to examine the colour palettes reproduced from the DRS paper and to let us know the colour combinations they like most and least. Next month, we will reveal the significance of your selections.



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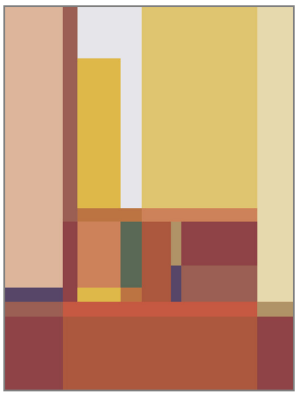

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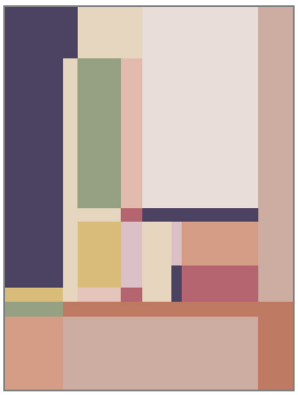

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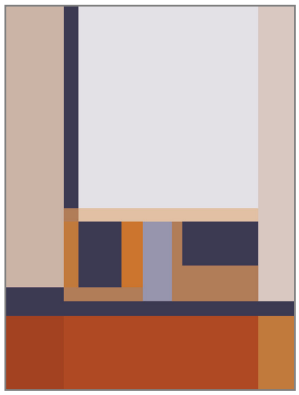

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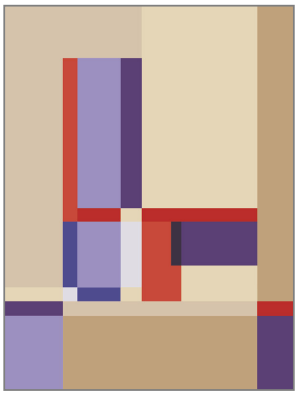

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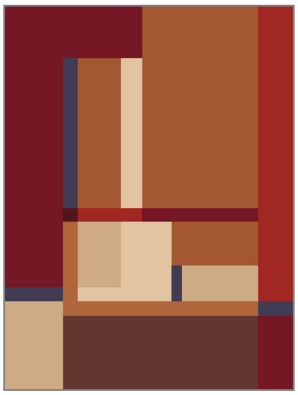

Palette F

Meanwhile, we didn't manage to find anything from the TRIZ literature this month that we felt was worthy of further recommendation. Maybe everyone is saving their good stuff for the ETRIA conference in Strasbourg in November? Hope so.

SYSTEM ATIC INNOVAT ION

Investments – 'Radio emerges from the electronic soup'

A little something that was pointed out to us from a recent issue of New Scientist. We liked the 'self' idea.

A self-organising electronic circuit has stunned engineers by turning itself into a radio receiver.

This accidental reinvention of the radio followed an experiment to see if an automated design process, that uses an evolutionary computer program, could be used to "breed" an electronic circuit called an oscillator. An oscillator produces a repetitive electronic signal, usually in the form of a sine wave.

Paul Layzell and Jon Bird at the University of Sussex in Brighton applied the program to a simple arrangement of transistors and found that an oscillating output did indeed evolve.

But when they looked more closely they found that, despite producing an oscillating signal, the circuit itself was not actually an oscillator. Instead, it was behaving more like a radio receiver, picking up a signal from a nearby computer and delivering it as an output.

In essence, the evolving circuit had cheated, relaying oscillations generated elsewhere, rather than generating its own.

Probably a tad too early to be thinking about taking money out of your pocket, but cool anyway. Get the full text at http://www.newscientist.com/news/news.jsp?id=ns99992732