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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.

Our guarantee to the subscriber is that the material featured in the e-zine will not be published elsewhere for a period of at least 6 months after a new issue is released.

Readers' comments and inputs are always welcome.
Send them to **darrell.mann@systematic-innovation.com**

Finding The Future From The Past

Introduction

The ‘past’ element of the TRIZ ‘9-Windows’ thinking tools (Figure 1) is most commonly used in the context of looking backwards from a given problem situation to examine whether someone has solved a problem before somewhere. In this sense, the past viewing perspective is being used in an analytical manner rather than in a creative manner. This analytical thinking mode is fundamental to the traditional Western thinking styles that have been with us since the times of Socrates, Plato and Aristotle. It is a style that is almost the complete opposite of the style we require to use when we are looking to design a way forward into the future.

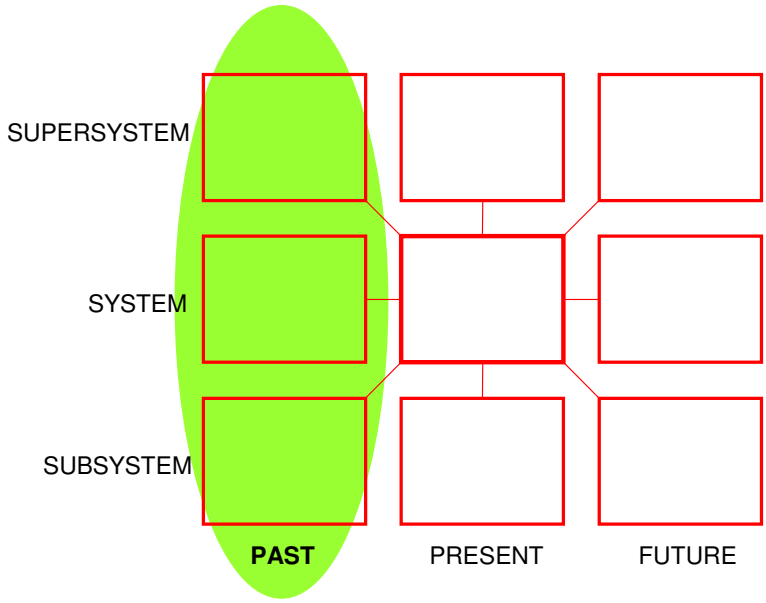


Figure 1: 9-Windows and ‘The Past’

The purpose of this article is to examine how we can use the ‘past’ aspects of the 9-Windows not just as an analytical tool, but also as a means of presenting new perspectives on a problem that can help us to design a stronger solution.

Time Travels In One Direction Only

Time, alas, travels only forwards. This fact, coupled with the phenomenon of psychological inertia presents us with a number of problems as we try to advance and improve the way we do things.

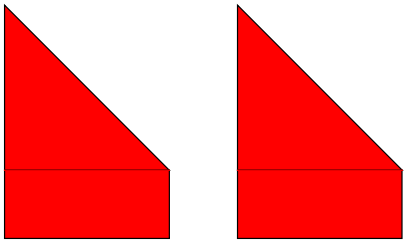


Figure 2: Arrange The Pieces to Minimise the Number of Exposed Edges

To take a simple example that we hope will provide a valid model of other, real-world scenarios, think about a problem in which we are given the two shaped pieces illustrated in Figure 2.

Given an objective to arrange the two pieces in a manner which minimizes the number of exposed edges, it shouldn't take long to work out that the 'best' solution is the one shown in Figure 3 – any other arrangement resulting in more than 4.

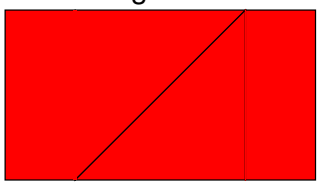


Figure 3: Solution To First Problem

Having solved this problem, we can set another with the same 'minimise the number of exposed edges' objective by introducing the new shape illustrated in Figure 4.

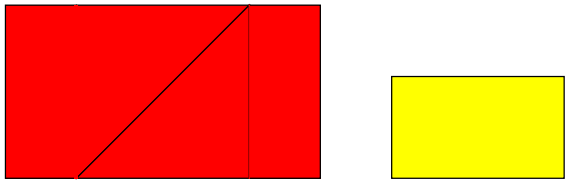


Figure 4: Extension to First Problem

This problem appears a little simpler than the previous one. A possible 'best' answer is illustrated in Figure 5.

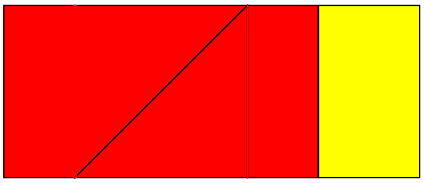


Figure 5: Solution to Second Problem

Having solved this problem, the next two – adding two more shapes to the puzzle (Figure 6) should be fairly straightforward.

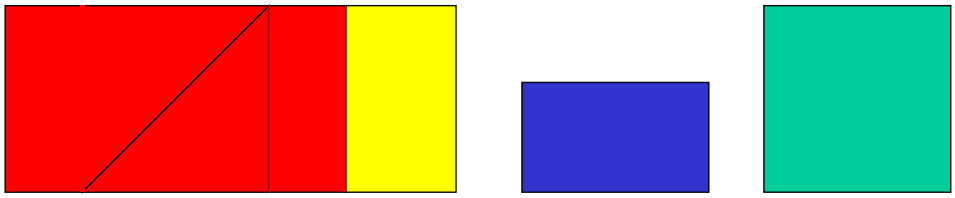


Figure 6: Two Additional Shapes to Add to the Problem Situation

As, indeed, Figure 7 illustrates:

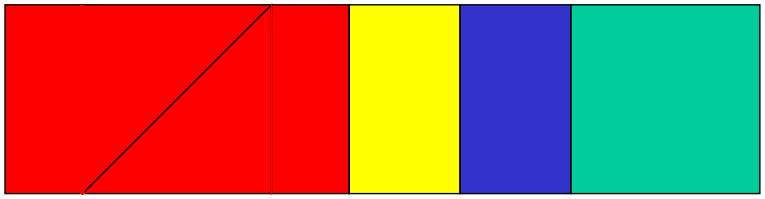


Figure 7: Solution to Figure 6 Problem Situation

Figure 8, on the other hand, appears to offer more of a challenge.

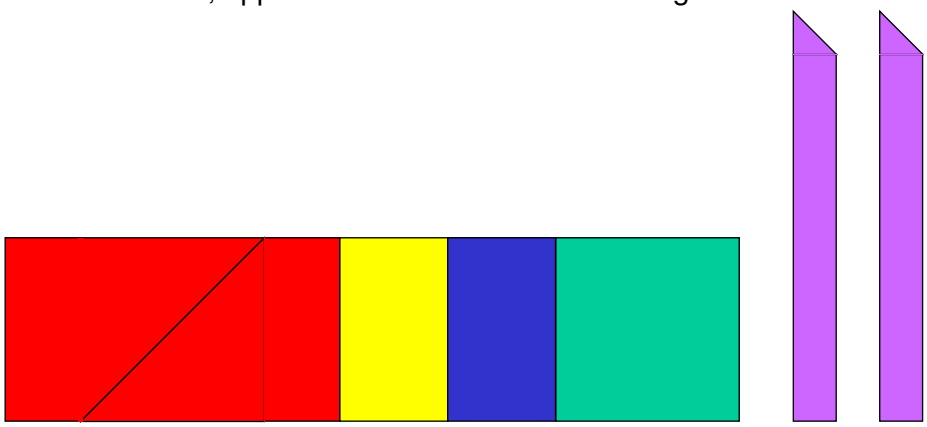


Figure 8: Another New Problem

This time, applying previously successful solution 'tricks' is only partially successful. The best we can do, in fact, is to produce the 6-edged shape illustrated in Figure 9.

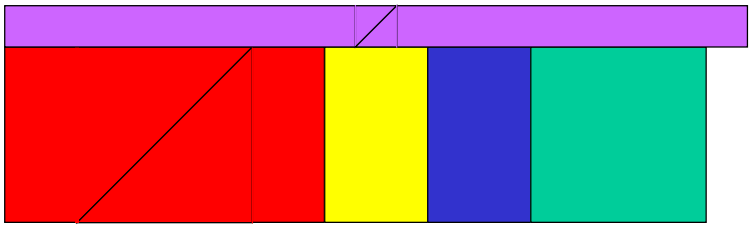


Figure 9: Not Such a Good Solution to the Latest Problem Situation

Closer analysis of the Figure 8 problem, however, should suggest that there is actually a much stronger solution. That stronger solution is illustrated in Figure 10.

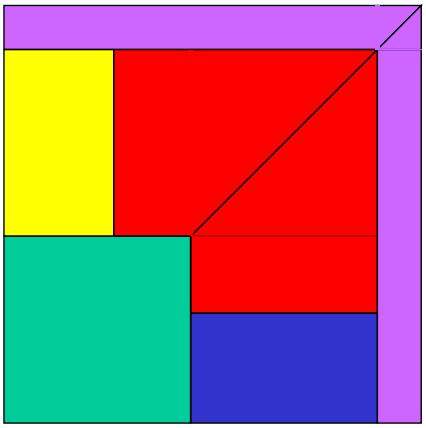
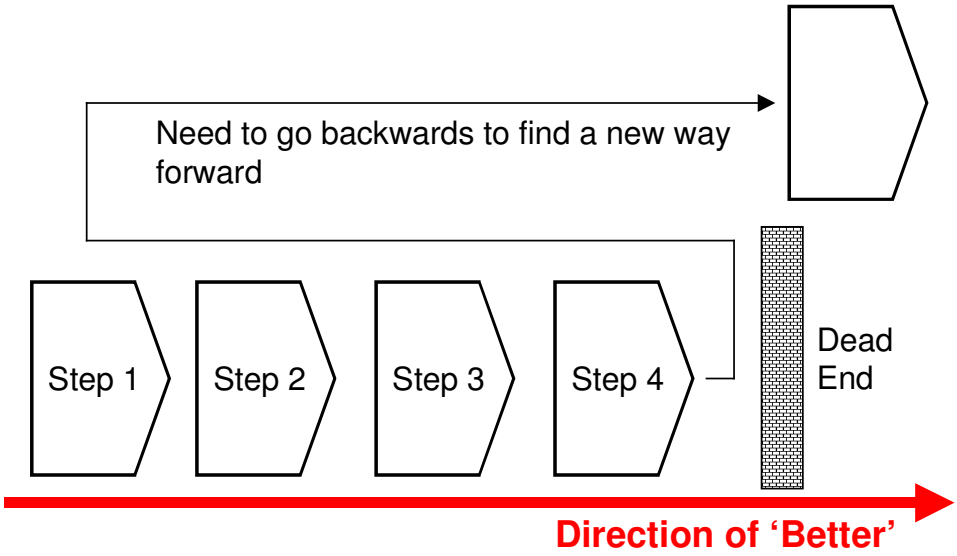


Figure 10: Much Stronger Solution to the Latest Problem Situation

The point of the article is that the Figure 10 solution cannot be derived by building from the previous solutions as had been the case in earlier problems. In fact, to solve this problem, we have to go right back to the beginning and re-arrange all of the shapes. This phenomenon is partly attributable to a psychological inertia effect (previously successful strategies make is ever more prone to rely on them in the future – Reference 2), but the main point is that sometimes, irrespective of psychological inertia it is physically impossible to succeed in the future by building on the previous solution.

As illustrated in Figure 11, sometimes a chain of solutions can lead us along a road that eventually stops in a dead end. In these situations, it becomes necessary to re-trace our

steps to get back to earlier states in order to find a route to the new solution. The analogy works for all types of problems and, in keeping with the theme of the article, emphasizes the important role the 9-Windows can play in tracing a road-map of previous solutions –



one of which may, in the future, turn out to offer a previously unspotted opportunity to find another road to travel; one that leads in the future, to an ultimately stronger solution.

Figure 11: Sometimes We Must Travel Backwards to Make Additional Progress Forwards

References

1) DeBono, E., 'Parallel Thinking', Penguin Books, 1995.
2) TRIZ Journal, psychological inertia special issue, August 1998.

Serving The Greater Good

The TRIZ trends of evolution, whether focused on technical or business trend patterns are generally observed to travel in one consistent direction towards increasing ideality. Of course, it is clear that there are exceptions to this general rule, and that sometimes a system can evolve (usually temporarily) in a direction generally accepted to be one associated with decreasing ideality. The over-riding rule determining such evolution directions shows that any system evolving towards increasing ideality may include sub-systems evolving in the opposite direction. This phenomenon is illustrated in Figure 1 in conjunction with the CREAX evolutionary potential radar plot method of describing the evolutionary state of a system at a given time (Reference 1).

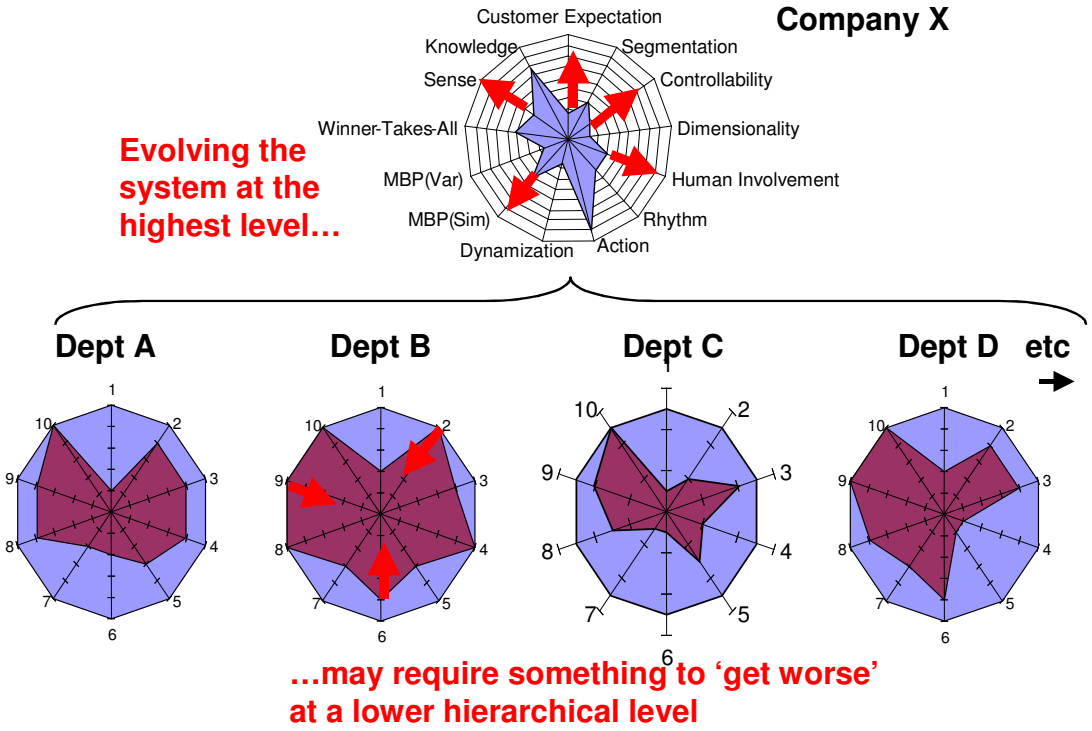


Figure 1: Increasing Ideality at the System Level May Require Decreasing Ideality at the Sub-System Level

This evolution characteristic can apply to both technical and business systems. Figure 1 illustrates an example for a hypothetical business structure. Drawn for such a system, it may be noted that there is a very high degree of consistency with the fundamental ideas expressed in the Theory of Constraints (Reference 2), where, in simple terms, one of the principle guiding philosophies is the avoidance of local optimization (i.e. optimization at the sub-system level), if that optimization does not serve the greater good of the whole system.

Recognising that sub-systems can evolve backwards as well as forwards is an important aspect in using the TRIZ trends in their strategic context. Understanding the shifting dynamics between system and sub-system is crucial in this regard.

A final point worth noting is that the coupling between improving system and worsening sub-system presents organizations (and technical systems for that matter should we

choose to examine technical trends instead of business ones) with contradictions. As we know from elsewhere the eventual challenging and elimination of these contradictions lies at the heart of the dynamics governing the evolution of systems.

References

1) Mann, D.L., Dewulf, S., 'Evolutionary Potential in Technical and Business Systems', TRIZ Journal, June 2002.
2) Goldratt, E., 'Critical Chain', North River Press, 1997.

Humour

An interesting use of Inventive Principle 13C ‘turn the process upside-down’ in this photograph of a novel method of repainting the swimming pool. Don’t try this at home people.

Patent of the Month

Patent of the month this month is US6,421,659 granted to Xanavi Informatics Corporation in Japan on 16 July. The patent describes a '**map database apparatus'**. As quoted from the invention disclosure abstract:-

'A map database apparatus according to the present invention manages roads by expressing the roads as link strings. Each of the link strings is constituted by connecting a plurality of links, each of the links has nodes at a front end and a rear end respectively, the map database apparatus has node information concerning the nodes, and the node information includes guide data to be used for route guidance. And, the guide data have directional characteristics corresponding to an order in which the links are connected.'

The invention overcomes the following problem with conventional software-based navigation systems:-

'Vehicular navigation systems in the known art are provided with a function for displaying a roadmap of the area where the vehicle is currently located, a function for accurately detecting the vehicle position through map matching, a function for calculating a recommended route from a point of departure to a destination, a function for performing route guidance and the like. In these vehicular navigation systems in the prior art, roadmap display data, data for map matching, data for route search and route guide data are stored in a CD ROM in order to maintain compatibility with existing software programs and also to improve the processing speed.

Route guide data stored in a map database apparatus, which include intersection names, road names and the like, are used for route guidance, and since character strings and the like are included in the route guide data, the data volume is very large, thereby necessitating efficient data processing. In addition, since an intersection is assigned a single, uniform name regardless of the direction from which the vehicle approaches the intersection, there is a problem in that accurate route guidance cannot be implemented at an intersection to which different names are assigned depending upon the direction from which it is approached.'

The invention solves the problem by attaching route guide data having directional characteristics to road junctions and key way-points.

The main reason we like this patent is that it offers a neat example of the geometric evolution trend in action. Not immediately obvious at first perhaps, but if you think about the evolutionary jump from a point to a line, that is basically happened here. To think of software and 'geometric evolution' may sound rather odd. The key question at all time when using any of the TRIZ trends is ' can I make any connection between this particular trend stage and my system (at all times trying to make connections as far to the left hand side of the trend as possible. The connection here; a road junction represents a point; a road junction with directional characteristics represents a vector; which in turn is a line.

Under normal circumstances, we tend to stay away from software-based patents (patenting lines of code still seems rather odd in our part of the world), but we definitely like the idea of using the trends to help write more effective software.

Best of the Month

Slim pickings again reading-wise this month. Nothing of a specifically TRIZ-like nature to recommend (unless you haven't read 'Natural Innovation' yet – see News).

Otherwise, we're going for the Tom Peters 'Project 50' book. The main thesis of the book is that as the rate of change of work accelerates in the world, it is increasingly likely that all the work we do will be different from the work we did before – hence everything becomes a 'project'. The book offers some very neat examples of the 40 Business Principles in action as well as being an easy read. The book actually came out a couple of years ago (we were a little slow off the mark – sorry!), but is part of a series of '50 ideas' books that is still growing. We recommend this one in particular because it sets the scene for all the downstream books.

Conference Report – International Society of Forecasting, ISF2002 Conference, Dublin 24-26 June

We presented an updated version of our 'Evolutionary Potential' article from the June 2002 issue of TRIZ Journal at the ISF conference in Dublin, Ireland during June. The paper was, to say the least, different from most of the other things presented at the conference – it being an event primarily attended by the people who spend their lives forecasting how many mobile phones or aeroplane tickets the world will buy in the coming years.

One of the most telling statistics of the week came during a paper by Kesten Green, who was reporting the results of a study on predictions concerning the outcome of industrial conflict situations. To summarise a large piece of work in a very small number of words, the study concluded that the forecasting 'experts' got their predictions right about 30% of the time, while teams of non-expert lay-people got their predictions right also about 30% of the time. In other words, the state of the forecasting art is probably bested diagnosed as 'poorly'.

The sentiment was re-enforced by other speakers, more than one of whom suggested that the way forecasting was done in many organizations was to identify a desirable outcome and then construct a forecast that produces this rule. (Which probably explains why a conference full of future-prediction experts did not appear to contain anyone that had made any money on the stock market.)

Anyway, the most interesting points to come out of the conference from a TRIZ perspective were as follows:-

1) Non-linearities. The thing that always seems to screw-up the fine predictions of the forecasters are the non-linearities. September 11 is an example of such a non-linearity. This is one that is probably very difficult to predict. But then digital photography, mobile phones, and related disruptive technical innovations are very much more predictable. A blinding flash of the obvious: *TRIZ trends predict the non-linearities that make the forecasters wrong.*
2) Taking it further. Taking the above idea a step further, it would seem that the forecasters that predict the future of businesses almost fundamentally lead those companies away from the facts they require to identify the threats and opportunitie to their future business. A simple example that came up during one of the keynote addresses at the conference, a paper by Boeing on prediction of future international air travel. One of the delegates asked whether immigration/emigration between a pair of countries affected the level of air travel between those countries (e.g. increased home visits, visits by relations, etc). The answer; 'very slightly in the first two years and then nothing, and so we don't include it in the model'. Thus everyone in Boeing reading the resulting normalized numbers (see our previous rant on the subject of normal curves) does not get even an inkling that there might be a disruptive opportunity to be had. From our TRIZ perspective, the first thought that struck our minds as we heard the question, was why doesn't some forward thinking airline introduce a win-win travel scheme to encourage more travel, encouraging friends and relatives to keep on visiting each other when someone has emigrated. In other words, don't just use the forecasting data as a forecasting tool, use it as an opportunity finder.

3) Taking this a step even further, it also seems to us that the normalization, smoothing and other data smudging tactics of the forecasters are all tools that serve to hide the potential disruptive innovation opportunities. Every one of these data reducing assumptions made by a company is an opportunity for their competitors to steal the initiative. Forecasters that publish papers justifying and declaring their assumptions are very simply offering the disruptors the data they require to identify and develop the non-linear innovations that will eventually – based on history – put the companies of those forecasters out of business.
4) Top-down versus bottom-up. Forecasters work top-down from economic and market data. They take very complex situations and try to generate very simple algorithms to predict what they will do in the future. It is hardly surprising that they are wrong so much of the time. The TRIZ trends offer a bottom-up means of constructing complexity from established trend patterns. We think there is massive potential in this area. This is, of course, not a top-down *versus* bottom-up debate (we don't like either-or situation as you know), merely a suggestion that top-down alone is not the way to successful forecasting.

Post-conference, we have been asked to produce a paper for the Technology Forecasting and Social Change journal picking up some of the above points. We will let you know as this work evolves.

Investments – 'Functional Foods'

Food, like clothing from an earlier newsletter, is one of those things that humans can't live without. Its ubiquity means that it is highly likely to be one of the super-system function deliverers that will tend to take on the function of other things.

By way of example, thinking back to our previous article on toothbrush evolution, the ideal final result toothbrush delivers clean teeth but doesn't exist. In other words, another resource from somewhere else will take on the function of the toothbrush we know today. Initially this looks like being 'toothpaste chewing gum', but in time it could well be that the food we eat could take on the function – tooth cleaning desserts?? We think Ben & Jerry's should get on the case immediately.

On a more serious note, the concept of 'functional foods' – food product that deliver more than just the function 'nutrition' – are definitely on the rise. In research terms it has been a big area for some time. We suggest you check out

http://www.functionalfoods.nu/dyndefaultframe.asp

to have a look at what's happening in this area. Some interesting investment areas, and, being food, some relatively short term hits we suspect.