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THE VALUE MANAGER

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The election of council members (2006 – 2007) had been approved in the 10th AGM on 15 December 2005. There are a total of 10 new council members, they are as follows:

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AIMS AND OBJECTIVES OF THE HKIVM

- To create an awareness in the community of the benefits to be derived from the application of Value Management in Hong Kong.
- To encourage the use of the Value Management process by sponsors.
- To establish and maintain standards of Value Management practice in Hong Kong.
- To contribute to the dissemination of the knowledge and skills of Value Management.
- To establish an identity for the Institute within Hong Kong and overseas.
- To encourage research and development of Value Management with particular emphasis on developing new applications of the process.
- To encourage and assist in the education of individuals and organisations in Value Management.
- To establish and maintain a Code of Conduct for Value Management practitioners in Hong Kong.
- To attract membership of the Institute to support these objectives.

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EDITORIAL

Welcome to the last issue of the publication for the year 2005. In addition to the President's Report given on the 10th AGM in December, we have printed three papers, all of which focused on the role of value management in innovation. The first paper, written by Dr. Paul R. Filmore and Dr. Pete Thomond, describes the efficacy of training key workers in systematic problem-solving and creative methods. It discusses the implications for managers in innovation promotion and workplace environment change. The second paper, written by Darrell Mann, explores how the TRIZ developed by the former Soviet Union helps users to systematically and reliably create breakthrough solutions to problems of all descriptions. The third paper, written by Eric Spain, introduces a three dimensional "Value Space", which was evoked by the author's experience in helping to stop a project that would have despoiled a beautiful and ecologically unique part of China. Enjoy!

Geoffrey Shen

Editor, The Value Manager

MESSAGE FROM THE PRESIDENT

Tony Wilson
President of HKIVM

We are nearing the end of another busy year. There appears to be a general improvement in most sectors and we hope it will be sustainable. One area in which progress is difficult and slow, is that of our air quality. It is not uncommon to have sunny days with the murky haze of pollution hovering around obscuring the views to our harbour and country areas.

This is similar to the situation we can find in procuring projects. We know where we are going and how to get there, but there is something in the way making the experience more difficult.

Recently I have found that there is still inadequate consideration given to project definition at the earliest stages. The Client requirements are not resolved or fully understood, political issues are not positioned, and environmental aspects are put off until later with not enough thought given to the surroundings of the site.

What happens is that these non-considerations are risks? Each of them could become a major risk and delay or stop the project but it shouldn't happen if there is a proactive approach to identifying what is to be done up front.

The use of Value Management at the first idea for a project can clear much of the haze by helping to explore the unknowns and identify the major risks. We have found that value management and risk management compliment each other well when done at the very earliest stage. One of the objectives of the VM study can be to identify the major risks. This is not a detailed risk assessment but allows those involved to fully understand the way forward. After the VM study has clarified the scope, very early on in process there should be a separate Risk Management study to focus on the major risks and the likelihood of them occurring. This will give the project a very good start.

Our Institute has had a very active and successful year. The International Conference, seminars and training courses have helped us to achieve all of our objectives. My thanks to all those involved for their hard work and timely input to make these events such a success.

We are now working on the next major International Conference so please keep the first few days clear in early November 2006 as this will be innovative, include risks and bring in speakers from all round the world.

On behalf of the HKIVM Council, I would like to wish all our members and supporters everywhere, "Compliments of the season and a very happy New Year!"

Best Regards,

Tony Wilson
President, HKIVM

PRESIDENT'S REPORT AT THE 10TH ANNUAL GENERAL MEETING

Tony Wilson
President of HKIVM

The Institute has had a very busy and interesting year in which we achieved most of our targets. I will not dwell on details but focus on the main points.

Our 2005 priority was the 7th International Conference in June which was a resounding success. We achieved the required number of participants and quality speakers to ensure that our financial situation is improved from last year. Financial gain however, is not our main aim. We have through the Conference achieved all of our objectives and brought VM to the attention of many people. We have increased knowledge of VM in Hong Kong and the innovative interaction session that was held, was enjoyed by all who participated.

Many thanks to Vaughan, Doug and Mei-yung who were the key activists. Vaughan for his organisational skills and diplomatic leadership, Doug for his excellent networking and business sense as he obtained single handedly all our sponsorship, and Mei Yung who through the Professional Services Development Assistance Scheme achieved funded and more awareness training in VM than we expected. A list of the awareness events and training is attached separately. Many thanks also to all others that helped with this major event including support from Hong Kong Institute of Surveyors, City University and our Conference Consultant ICC.

Our next International Conference is for early November 2006 and we need volunteers for the conference committee to assist Vaughan and Mei-yung take up this challenge. We have an arrangement with the VM Institute of Australia to partner with us so it will be very special and exciting. We are aware that VM, Risk Management and Partnering are related and will exploit this in the conference papers.

Regarding our membership, the numbers have reduced slightly as per our target of trying to get payment for 100% subscriptions, we have removed some names with whom, we have lost contact or who have not paid last year's membership fees. We acknowledge that as a Professional Institute we have to maintain high standards but also that we wish to attract some younger members. Our membership team is now actively following up on this.

If any guests or members wish to join now or pay 2006 fees, please speak with Frederick who has some membership forms with him. We will be issuing for the first time, membership certificates for 2006.

We plan to have a Value Management road show which will be tailored to suit the different organisations we will present to. The problems we have encountered are finding the people and the time to do this. We also have to identify where we can make most impact. The Council will be working on this next year and if anyone would like to assist please contact me.

We have some links made to allow us to target some Small and Medium Business Enterprises in manufacturing and the service industries to try to spread VM from the mainly construction/project orientated base we have at present. In France, they are the other way round, so we target to do improve in 2006.

Regarding training, Mei-yung has been in discussion with Roy Woodhead, an ardent VM academic in the UK, who has been pushing us to consider a performance based VM qualifications for our Institute. At present we are investigating the reciprocal agreements situation between different countries, as we know that if we take this on it is a very demanding task. For members' information, we normally accept professional qualifications and membership of other VM Institutes before acceptance to our ETWB VM facilitator lists.

During the year, at the South East Asia Sustainable Building Design Conference in Kuala Lumpur, several speakers referred to Value Management as the enabler for success. Also at a VM conference in Korea recently, we found out that they will have a mandatory law to apply VM to all projects and they were

very unsure how to go about it. We were able to share the Hong Kong experience with them as well as our International experience.

To conclude this report, we have been very successful in 2005 but can always do better in 2006. I would appreciate your acceptance of the report and wish you all compliments of the season.

THE VALUE AND IMPLICATIONS OF TRIZ FOR ENGINEERING MANAGEMENT

Dr. Paul R. Filmore
University of Plymouth, UK

And

Dr. Pete Thomond
The Insight Centre Ltd, UK

ABSTRACT

The engineering industry needs to be more innovative. A case study of a recent breakthrough innovative development by Michelin is discussed. The influence of prior training with systematic problem solving method TRIZ, on the innovation team, is assessed using a questionnaire. The questionnaire is based on a company innovation audit model proposed by Mann and influenced by the creativity model of Baille. Results are discussed which show significant innovation development when using TRIZ. The efficacy of training key workers in systematic problem solving and creative methods is discussed and the implications for managers in innovation promotion and workplace environment change are highlighted.

INTRODUCTION

In today's competitive environment, the engineering industry is in desperate need of innovations and for the management of innovation. Many authors have proposed models to help understand the innovation process. These can be categorised as: general problem solving techniques, psychological techniques (e.g., DeBono, Buzan) and specific techniques (e.g., 6 Sigma, QFD, Taguchi). These categories are breaking down as innovation practitioners learn to integrate the techniques. Wu (2004), for example, uses a classical problem solving structure with creative methods such as brain storming, but bases the whole structure around TRIZ and Taguchi methods.

Innovations can be categorised by incremental or step change. The step change may be the result of scientific breakthrough (often as a result of pure research) or the creative juxtaposition of current knowledge/ techniques. In January 2005, Michelin circulated a press release on their new developments in wheel technology (Michelin, 2005). Most noticeable in terms of an innovative development was the Tweel™, an integrated car tyre and wheel with no air (see Figure 1)!

Figure 1: The Tweel™

The Tweel™ development appears to fit into the 'step change' and 'creative' development categories. On further investigation it seems that the innovative breakthrough only happened after an unproductive team (in terms of dramatic breakthrough) undertook a course in systematic problem solving based on TRIZ.

This paper investigates the likelihood that the TRIZ course and subsequent use of TRIZ by one research group had a significant influence on the innovation breakthrough, and thus asks

whether there are lessons to be learned in the management of innovation and its potential for industry.

SYSTEMATIC PROBLEM SOLVING USING TRIZ

An overview of TRIZ tools has been given by Eric Spain at a recent VM conference (Spain, 2003). In terms of creative step change innovation, two of the TRIZ tools stand out as having the potential to lead engineering teams to the breakthrough thinking required. These tools are: the 'Ideal Final Result' and 'Trends of Evolution' and for the case study of wheel development here, examples are given. Other tools such as 'Function and Attribute Analysis' could also have underpinned the problem definition phase.

The Ideal Final Result (IFR) tool challenges engineers and managers, to break out of 'continuous improvement'/ incremental change thinking, to which most organisations are prone. The IFR is defined in terms of 'ideality' (which is where technological evolution migrates towards). The definition has been adapted from the value equation of Value Analysis and Engineering in the early 1950's (Rantanen & Domb, 2002):

Ideality = (Perceived) Σ Benefits

(Σ Costs + Σ Harm)

An ideal system would then have all the (Σ = 'sum of') benefits without any cost or harmful effects. Features could include: being free, self calibrating, self cleaning, self regenerating, self regulating etc.

In the case of the wheel, questions could be (and were) asked such as, 'can an ideal wheel have no air', (so that blowouts can be eliminated: an example of a 'harm').

'Trends of Evolution' is based on TRIZ research which has identified 35 technology trends, which technological progress follows across a wide variety of industries. The s-curve is well known in technological forecasting (e.g., Meredith & Mantel, 1995) where technology approaches the more ideal/ greater value with time, by going through stages often labelled as conception, birth, infancy, growth, maturity and retirement (see Figure 2). What is known is that industry puts more and more energy into progressing the move towards the ideal, with only incremental change. The 'trends' tool (concept), focuses the engineer into looking for the evolutionary jump to the next s-curve, which bypasses the (often physical) limitation of the present s-curve.

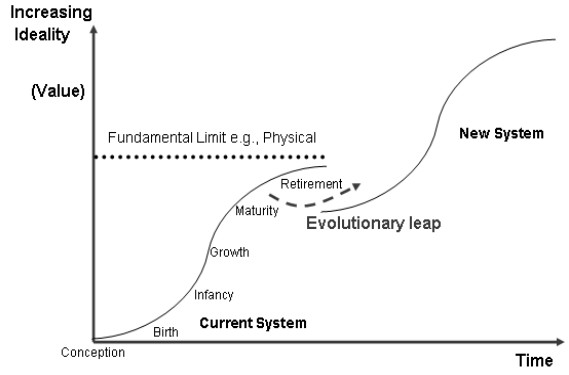

Figure 2: The s-curve of performance and functionality improvement. Eventually performance improvement reaches a point of diminishing returns unless there is an evolutionary leap.

For the wheel, one of the evolutionary trends that have relevance is 'Space Segmentation' (see Figure 3). For this trend, monolithic solid things evolve into hollow things, which evolve further into structures with multiple hollows, to structures with capillaries/ porous structures and finally to porous structures where the cavities are filled with some kind of active element. In the case of the wheel: in the past we had solid tyres, at present tyres filled with air (hollow structures) and with the development of the Tweel™, we could argue, we have a structure with multiple hollows.

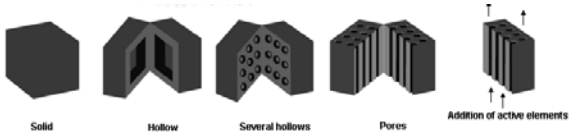

Figure 3: The space segmentation trend (Creax, 2005)

Another trend 'Webs and Fibres' (Figure 4) has an evolution from: 'homogenous sheet structure' (if we think of a cross section of the first tyres), to '2D regular mesh structures' (steel wires embedded in the rubber), to '3D fibre, alignment according to load conditions'. The later is similar to the Tweel™ with the rubber 'not now needed', and the 3D structure designed to 'support' in different ways at

different angles to the axel, for different applications/ road usage.

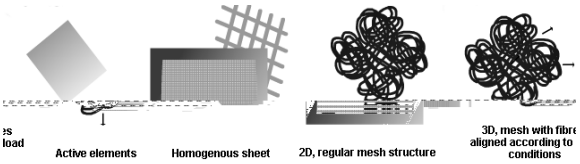

Figure 4: The webs & fibres trend (Creax, 2005)

Finally, TRIZ tools such as Functional Analysis (see Mann, 2002) questions fundamental assumptions e.g., questions could be and were asked such as 'what is the function of air (in a tyre)'?

THE QUESTIONNAIRE BACKGROUND

This questionnaire was based around the model proposed by Mann (2004), that a company's innovation potential is based around the three areas of company knowledge, creativity and action:

*Innovation = Knowledge * Creativity * Action*

where the three areas are split into the following sub areas, called (innovation) parameters:-

Knowledge parameters

Internal - company efficacy in: use, organisation and management of knowledge

Customer – company efficacy in gaining knowledge from (past, present & future) customers and competitors

Intangibles – company efficacy in utilising intangibles e.g., branding, workforce skills, external alliances etc.

Global/ Environmental - company efficacy in accessing and utilising global knowledge

Direction - company efficacy in managing constantly changing and evolving knowledge

Creativity parameters

Need aware - company efficacy in promotion and support for innovation

People - the level of creativity i.e., sum of all the individual's creativity in the organisation

Tools – a measure of the number, quality and effective deployment of the available creativity and innovation tools, techniques and strategies

Action parameters

Specification - company efficacy in producing the product or service it is trying to develop

Cost Issue - company efficiency in transforming its financial resources into useful output

Time Issues - company efficacy in using its time resources

Risk Management - company efficacy in understanding and accommodating risk issues into its innovation activities

Co-ordination - company efficacy in managing the overall innovation process

A full company scan comprising over a 100 questions using this model, can be found on the CREAX web site (www.creax.com/cis). For this investigation with Michelin, it was thought that individuals would not answer a lengthy questionnaire, and so a single question was developed for each of the innovation parameters. For each parameter, the question asked for a company evaluation both before the TRIZ course and at the present time (i.e., when using TRIZ). Also the degree of influence of TRIZ on any perceived change (before and after the TRIZ course) was requested, to ascertain whether the change had anything to do with TRIZ or whether it was due to some other influence/ factor.

Finally the questionnaire wording was influenced by the Creativity Model of Baille (2002: see Figure 5) and Mann, Baille & Dewulf (2000), where internal (personal) and external (organisational) barriers to creativity are identified.

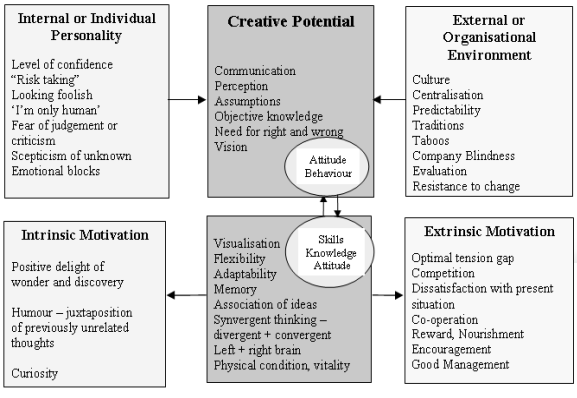

Figure 5: The creativity model (Baille, 2002)

RESULTS

Comparison of present situation against generic data from a variety of industries

Overall, in the radar plot results of the company innovation audit shown in Figure 6, Michelin shows up well in all aspects of the innovation scan in comparison to other companies. The generic data is taken from Mann (2004) and is also that on the CREAX web site mentioned earlier. No information is made available of the background to the industries etc. that make up the generic data.

Figure 6: A comparison of Michelin's innovation potential with other companies

Scale: Centre = '0' i.e., poor/weak and outer ring = '5'' i.e. good/strong. Key: 'Blue' line = generic company comparison, 'red' shaded area = actual company data.

Comparison of present situation at Michelin with that pre-TRIZ course

Figure 7 shows how the TRIZ course has improved/ strengthened nearly all of the innovation parameters, but most noticeably in the creativity areas.

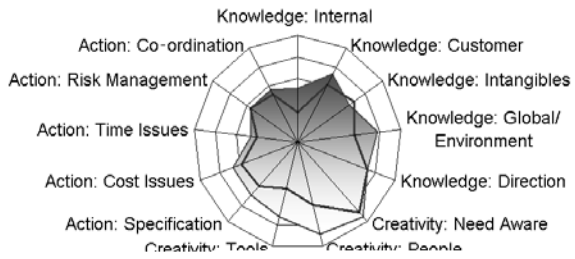

Figure 7: A comparison of Michelin, pre-TRIZ course and with the present situation

Scale: Centre = '0' i.e., poor/weak and outer ring = '5'' i.e. good/strong. Key: 'Red' line = pre-TRIZ course, 'red' shaded area = present post-TRIZ situation.

Perceived influence of the TRIZ course for each parameter

The perceived influence of the TRIZ course on each of the parameters is displayed in Figure 8. Again it can be seen that the creativity parameters are considered to have been strongly influenced by the TRIZ course. Also a number of other areas have also been slightly influenced.

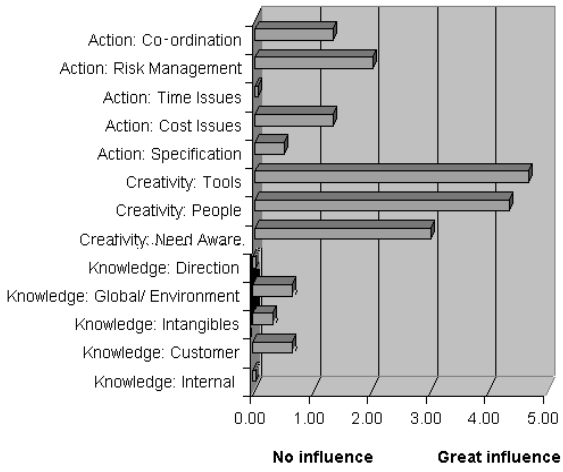

Figure 8: The perceived influence of the TRIZ course on the parameters

ANALYSIS

From the data presented above, it can be clearly argued that in the perception of the respondents, the introduction of TRIZ has greatly influenced the company's innovation potential/ profile. Taking the difference between the pre-TRIZ course and the present situation (Figure 7) for each of the parameters, and multiplying each of these by their respective 'perceived influence' values (from Figure 8), gives a measure of the actual TRIZ introduction effect on the company. This is shown in Figure 9 and clearly shows areas of major and those of lesser influence. Overall it shows that 8 out of the 13 parameters have been influenced positively, and 2 out of these, very significantly. Of the remaining 5 parameters, none has been significantly influenced, negatively. It is reasonable to expect the creativity areas to be most significantly influenced. Why the parameter 'Creativity – Need Aware' is not

more significant is of interest and needs further research. It is most likely that the responses given in the questionnaire reflect the company as a whole rather than the innovative research group.

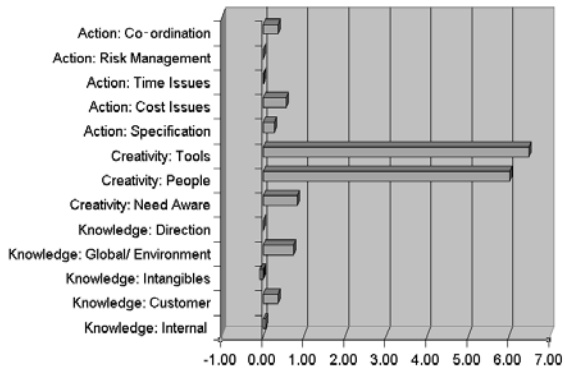

Figure 9: The 'overall effect' of TRIZ introduction on the innovation scan parameters

The value of an innovation scan based on people's perceptions can be questioned. Certainly hard facts can be gleaned in many areas, e.g., number of creativity tools used in the organisation, number of risk management tools/time allocated per project. Three real benefits do, however, stand out. The first is the use of a perception questionnaire to benchmark present situation against the past or against competitors/ other business sectors. Secondly, a means of informing management of the perceived innovation potential and so flag any developing issues or areas (the 'parameters') of weakness. Thirdly, a way of feeding back to the workforce their perceptions; to motivate for change, and to reduce (creative) inhibitions. Referring back to the 'Creativity model' in Figure 5, it can be seen that there are many areas of both personal and organisation issues that the results can be used to addressed. Central is the need to develop a climate of creative potential, where staff are not humoured (or worse) for suggesting 'out of the box' ideas, but are valued and rewarded (praise, suggestion scheme awards, etc) for innovative ideas. In addition there is growing recognition that innovation methods such as TRIZ need to be taught and mentored (Smith, 2004) in a planned way.

DEVELOPMENTS

An extra question was added to the questionnaire in order to investigate how the proportions of incremental innovation, breakthrough (or step change) innovation, and disruptive innovation, had changed from prior to the TRIZ course to the present. Although the results show a significant move from incremental to step change innovation, the results on disruptive innovation are ambiguous. This is most likely due to misunderstanding of the term 'disruptive innovation' (see Insight, 2005). This is of concern, as disruptive innovations have the potential to take away markets, and are of significant threat, particularly to larger organisations, who continue with incremental innovation without being responsive to business environment change. A company disruptive innovation audit questionnaire is available, and needs to be used to evaluate this situation (Insight, 2005).

Rather as VE has association with VM, TRIZ, which was developed in the engineering domain, has now been applied in the management sphere. For example, management 'Trends of Evolution' have been identified (Mann & Domb, 1999). There are possibilities for using these techniques to investigate management innovation potential along similar lines to those reported.

CONCLUSION

TRIZ is a means to assist inventive problem solving that has achieved remarkable success in many areas. It is still being discovered, by the engineering community (e.g., the new TRIZ section on the Institute of Mechanical Engineers web site: IMechE, 2005). Anyone in the area of thinking processes, including Value Management practitioners, must be struck by Altshuller's (the father of TRIZ) finding that 95% of 'new problems' have already been solved, probably many times over. Do we need to spend most of our time 'reinventing the wheel'?

Two quotes stand out from respondents to the questionnaire:

'As an example, my team was able to generate a set of 13 solutions to a particular problem during a four hour TRIZ problem solving session that I facilitated. The quality and thoroughness of the resultant patent stands head and shoulders above other patents whose claims were derived by more traditional methods'.

'Partly as a result of TRIZ training, my team produced greater than 30% of all the invention records submitted by our research site over the course of 2003, whereas we only represent 7% of the population that usually submit such records'.

It is now appreciated that innovation makes a large contribution to the wealth of a nation and its society, but there is little appreciation that those who are asked to innovate must be given training before they can do it. There is a strong belief that innovations only come from gifted people or by flashes of insight, rather than the possibility that systematic methods which promote innovation, can be learned.

The case study in this paper has shown that people have the capacity to invent and innovate more effectively, when given the training in systematic problem solving tools such as TRIZ. This is an area often marginalised or missing from our education system. The paper also discusses briefly how the work environment can limit thinking to incremental change. One of the tools for managers to break the mould is by using the results from a company innovation perception questionnaire to drive change, and create a creative workplace environment.

ACKNOWLEDGEMENT

Ralph Hulseman: External Research, Michelin Americas Research & Development Corporation, SC, USA.

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SOMEONE, SOMEWHERE REALLY DID ALREADY INVENT THE WHEEL YOU'RE ABOUT TO RE-INVENT

Darrell Mann
Systematic Innovation Ltd, UK

ABSTRACT

Imagine the biggest study of human creativity ever conducted. Picture the systematic study of close to three million of the world's most successful patents, discoveries and business concept innovations. Picture, then, the construction of a problem solving method which then combines those solutions into a whole that strips away all boundaries between different industries and allows users to readily access the best practices of others. Now imagine that it exists. What you're seeing is TRIZ. The reason you may not have heard of it before, is that it was devised and developed in the former Soviet Union, and practically no one outside the Eastern Bloc had heard of it before the fall of the Berlin Wall. In this paper, we examine an evolved version of TRIZ and explore how it is helping users to systematically and reliably create breakthrough solutions to problems of all descriptions, without the re-inventing the wheel. A final section of the paper provides a pair of short case study examples to demonstrate the high probability that someone, somewhere has already solved your problem.

INTRODUCTION

TRIZ stands for Teoriya Resheniya Izobreatatelskikh Zadatch, which, translated into English, approximates to the Theory of Inventive Problem Solving. TRIZ research began in 1946 when engineer Genrich Altshuller was tasked with studying patents (Reference 1). TRIZ today represents the output of close to 2000 person years worth of research into not just patents, but successful problem solutions from all areas of human endeavour (Reference 2). The main findings of TRIZ are:

- That the same problems and solutions appear again and again across different industries, but that most organisations tend to re-invent the wheel rather than look outside their own experiences or the experiences of their direct competitors.
- That the most powerful solutions are the ones that successfully eliminate the compromises and trade-offs conventionally viewed as inherent in systems.
- That there are only a small number of possible strategies for overcoming such contradictions.
- That the most powerful solutions also make maximum use of resources. Most organisations are highly inclined to solve problems by adding things rather than making the current things work more effectively, or transforming the things viewed as harmful into something useful.
- That technology evolution trends follow highly predictable paths.

TRIZ was barely visible outside the Soviet Union until the fall of the Iron Curtain. Since then, the spread of the method has been relatively slow, thanks to a combination of language and cultural mismatches and the reluctance of organisations using TRIZ to describe their successes (and failures) to others.

TRIZ works on several levels – Figure 1 – firstly a collection of tools, secondly a complete process that links different tools together for any given innovation situation, and thirdly a series of philosophical ideas. In the first section, the paper focuses on TRIZ at its highest level – the distillation of excellence – and shows how this idea has now seen the extension of TRIZ boundaries into other methodologies and strategies. The second section of the paper then details the main philosophical pillars emerging from this distillation of excellence to form the basis of the evolved TRIZ. The third section then outlines a pair of simplified case studies in which the basic tools are used to solve a series of typical problems.

Extending the boundaries

The original TRIZ research focused on the distillation of excellence primarily as it existed in the global patent database. Not everyone

patents their good ideas of course, and so over time the knowledge search space has gradually expanded to encompass the sciences, manufacturing processes, psychology and, latterly, business (Reference 3). During the research to incorporate the best practices of business into the TRIZ framework, the knowledge search space has further expanded to include other tools and methods – Figure 2.

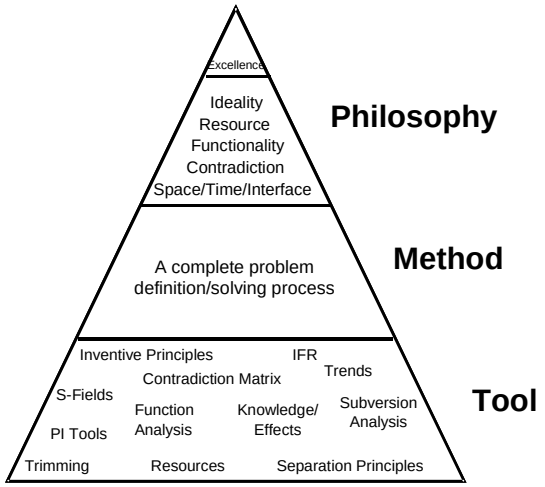

Figure 1: Tool, method & philosophical levels of TRIZ

The basic idea behind this broadening of scope has been the recognition that there is considerable convergence between different problem solving tools and techniques, and that the 'someone, somewhere already solved your problem' concept applies equally well to the evolution of those other methods. So, for example, if a user finds that they are having a problem with applying a certain tool in a certain specific situation, then according to TRIZ, someone, somewhere is highly likely to have found a solution to that problem.

One of the key outcomes from this evolved version of TRIZ is what is hoped to be at least the foundation of a global knowledge framework. An ongoing process of integration between different tools and methods (Reference 4) is seeking to understand and resolve conflicts that may be seen to exist between different tools – the key underlying assumption here being that if two methods are seen to produce useful outcomes, but are inconsistent with each other, then the inconsistency needs to be resolved in a manner which maintains the validity of both. Perhaps interesting to note from Figure 2 is that the link between TRIZ and value analysis goes back many years: The work of Larry Miles (Reference 5) first found its way (in evolved form – Reference 6) back in the 1970s.

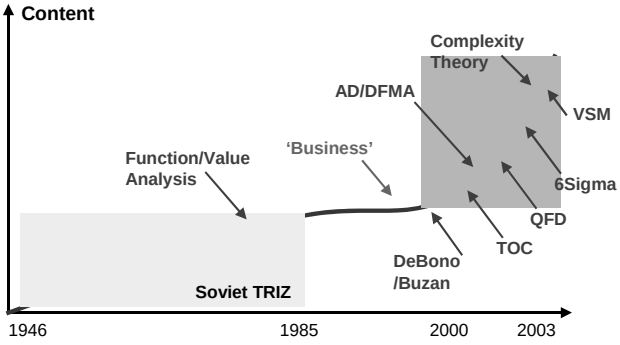

Figure 2: Evolution beyond 'classical' TRIZ

Assuming that a 'global knowledge framework' can be constructed (of course, such a framework will always need the flexibility to evolve as new knowledge emerges), the next question concerns how users might access the knowledge that is relevant to them. If someone, somewhere really has already invented the wheel you are about to re-invent, in other words, how can we find what has already been done? On our way to answering this question, we need to first examine some of the philosophical pillars of the evolved TRIZ method in order to gain a feel for the architecture of the knowledge framework:

PHILOSOPHY OF THE EVOLVED TRIZ – FIVE PILLARS

To some people the idea that someone, somewhere has already solved their problem might sound quite threatening. This is particularly so if, for example, we are a leader in our particular discipline and have been working on a problem for a long period of time. TRIZ recognises that a world expert in their field is exactly that. It also recognises that being an expert in a field is a full-time job. Few if any experts in one field have the time to become familiar with other fields. This, then, is where TRIZ hopefully becomes an opportunity rather than a threat. TRIZ research uncovered the fact that very different industries are all solving very similar problems, and that by constructing an appropriate framework for knowledge it makes it possible to systematically bridge the gaps that traditionally exist between different the industries and sciences. The expert, therefore, is offered the opportunity to see how experts in other fields have solved similar problems. Even

if, at first sight, those problems do not appear to be the same.

In both directions, TRIZ provides means for problem solvers to access the good solutions obtained by the world's finest inventive minds. The basic process by which this occurs is illustrated in Figure 3. Essentially, TRIZ researchers have attempted to encapsulate the principles of good inventive practice and set them into a globally generic problem-solving framework. The task of problem definers and problem solvers using the large majority of the TRIZ tools thus becomes one in which they have to map their specific problems and solutions to and from this generic framework.

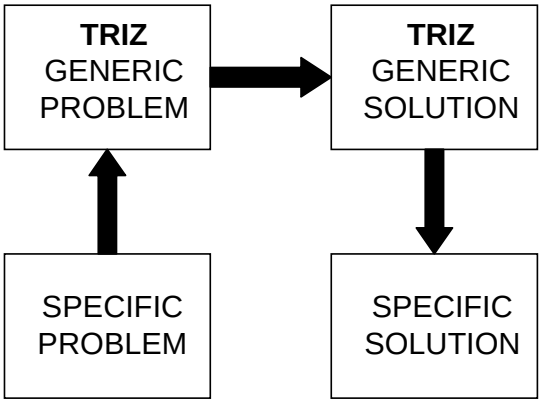

Figure 3: The Basic TRIZ problem solving process

Beyond this big idea of distilling all knowledge into a common framework, there are then five central philosophies underpinning the method. TRIZ can be used without knowledge of these pillars, and indeed many users are happy to simply take one or two tools from the toolkit. Nevertheless, appreciation of these big ideas undoubtedly increases the likelihood that TRIZ will deliver significant tangible benefit. The pillars are described in no particular order below:

Ideality

Ideality is in many ways similar to the concept of 'value' already familiar to those working in the value analysis arena. Ideality is defined as the sum of the benefits that a system delivers to its user divided by the sum of the cost of delivering those benefits and the any other negative side effects that may occur (waste, waiting time, environmental damage, etc). The TRIZ researchers identified a very simple phenomenon common to all successful innovations – that they all delivered a higher level of ideality than the products and processes that preceded them. Hopefully the idea that we should give customers more good things and less bad if we are going to be successful is not a great surprise. It does mean, however, that there is a definable direction of success. More interesting than this idea of direction is the concept of a final destination. In TRIZ this final destination is known as the Ideal Final Result (IFR). The IFR is defined as that point when the customer gets all the benefits they want, without any of the costs or harms. The IFR is deliberately intended to take us far beyond the traditional value analysis world-view.

Related to this evolution towards the IFR (recognising that every customer will potentially have a different definition of the IFR of course) is the knowledge that systems evolve through a series of discontinuous jumps or s-curves. Figure 4 illustrates a fundamental dynamic governing the evolution of all systems – any individual system will improve up to a point where it is incapable of improving further, then, provided the customer is demanding further improvements, the only way forward is to make a discontinuous jump to another system. The evolution of systems towards the IFR destination may thus be seen as a series of discontinuous jumps. This applies equally well to the evolution of methods. Value analysis itself, for example, is in many ways a science at the limits of its current form. Further evolution of the method is highly likely to require a discontinuous jump to another s-curve. Reference 5 again provides suggestions on what this jump might look like – based, of course, on the 'someone, somewhere already invented your wheel' idea. The next key finding of TRIZ is that the steps denoting a shift from one S-curve to the next are highly predictable. This may sound difficult to believe, but the overwhelming evidence from the analysis of all of the successful solutions is that there are a number of patterns of discontinuous jumps that repeat faithfully across different industries. This paper does not set out to 'prove' that these trend patterns are correct, but instead merely asks the users to speculate on the impact that predictable evolution would have on their business and the way it thinks about its future relative to competitors.

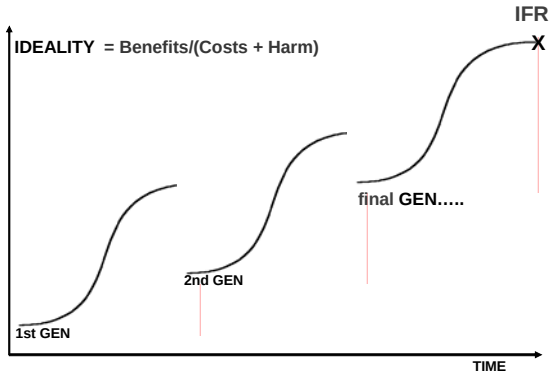

Figure 4: The fundamental dynamics of system evolution

Contradictions

Although often the first of the tools seen by newcomers to TRIZ, Contradictions is probably the tool that is deployed least well. At least part of the reason for this is that the main underlying principle of the Contradictions philosophy – that of seeking to identify and eliminate contradictions – is almost the complete opposite of traditional problem solving strategies. In nearly all problem-solving methodologies the emphasis is very firmly placed on the importance of achieving 'optimum' compromises between conflicting problem parameters. There is a strong tendency in a traditional design approach, in fact, to think of the design process as an amorphous bag filled with an incompressible fluid made from the different design parameters – Figure 5 – in which, as the designer tries to squash the bag to improve one parameter, it bulges out somewhere else as a different parameter gets worse. According to TRIZ, every time we opt for the optimum solution, we have missed an opportunity to achieve the ideal solution.
The keen emphasis on 'trade-off' solutions in traditional problem solving practice often means that problem owners are rarely explicitly aware that conflicts exist. The first major part of the paradigm shift that takes place in the Contradictions part of TRIZ is the need for problem solvers to actively seek out the conflicts and contradictions inherent in all systems. The second part then involves using the TRIZ methodology to try and 'eliminate' those contradictions rather than to accept them. Or, in terms of the incompressible-fluid filled bag analogy, to attach a valve of some kind that allows the amount of fluid in the bag to be altered.

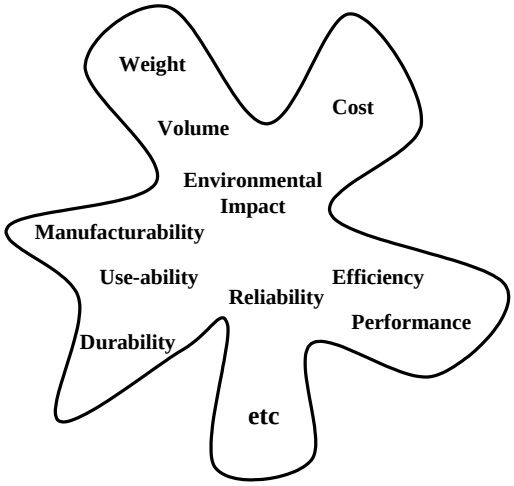

Figure 5: The design process as an incompressible-fluid filled bag

Once contradictions have been identified, TRIZ contains a number of 'contradiction elimination' tools – primarily the Contradiction Matrix (References 6 and, more recently, 7) – which encapsulate how others have successfully solved similar problems. At this point in time, TRIZ has identified 40 Inventive Principles which might apply in any given contradiction situation. The Contradiction Matrix allows problem solvers to narrow down that list of 40 to a more manageable five or six Principles which might apply to an individual contradiction type. There may, of course, ultimately be more than 40 Principles. As of today, however, wherever researchers look, we see the same 40.

Contradiction elimination is one of the most powerful of the TRIZ problem solving tools. A common phenomenon when problem contradictions are eliminated instead of traded-off is that the benefits tend to extend beyond those initially targeted during the problem solving process (References 8, 9).

In terms of evolutionary S-curves, it is the emergence of limiting contradictions (Reference 10) that ultimately restrict the ability of systems to give all of the benefits that customers desire and give the S-curve its characteristic flattened profile at the mature end of the curve. The TRIZ contradiction elimination tools thus have a very important role to play in allowing systems to transition from one S-curve to another.

The Contradiction Matrix represents one of a number of knowledge repositories within the

TRIZ framework. It is intended to act as one of the bridges that will allow a user to locate and deploy the contradiction-eliminating wheels already discovered by others. By way of demonstration of the breadth of this capability, consider for a moment the following problems:

- How to reduce tyre-wear on large aeroplanes
- How to increase computer data transmission integrity
- How to prevent deposition on the container during electro-less plating operations
- How to improve recovery of a catalyst following a chemical reaction
- How do we improve knowledge retention in students when there is never enough time to teach everything?

According to TRIZ, each of these five problems is identical when examined through the lens provided by the Contradiction Matrix. Not only this, but when we examine the inventive strategies used in, say, each of the first four cases, we discover that they have all used exactly the same ones. What this means is that, suddenly, if we find ourselves facing the fifth problem on the list, we can look to the first four problems – aerospace, ICT, manufacture and chemical – and access, in the abstracted form provided by the 40 Principles, the best of their solutions.

Functionality

Although the functionality aspects of TRIZ owe a significant debt to the pioneering work on Value Engineering by Miles (Reference 5), the method of defining and using functionality data is markedly different; sufficient at the very least to merit discussion as a distinct paradigm shift in thinking relative to traditional occidental thought processes. Three aspects are worthy of particular note:

- The idea that a system possesses a Main Useful Function (MUF) and that any system component that does not contribute towards the achievement of this function is ultimately harmful. In a heat exchanger, for example, the MUF is to transfer heat to the working medium; everything else in the system is there solely because we don't yet know how to achieve the MUF without the support of the ancillary components. (Systems may of course perform several additional useful functions according to the requirements of the customer.)
- In traditional function mapping, the emphasis is very much on the establishment of positive functional relationships between components. TRIZ places considerable emphasis on plotting both the positive and the negative relationships contained in a system, and, more importantly, on using the function analysis as a means of identifying the contradictions in a system.
- Functionality is the common thread by which it becomes possible to share knowledge between widely differing industries. A motorcar is a specific solution to the generic function 'move people', just as a washing powder is a specific solution to the generic function 'remove object'. By classifying and arranging knowledge by function, it becomes possible for manufacturers of washing powder to examine how other industries have achieved the same basic 'remove solid object' function. 'Solutions change, functions stay the same' is a message which forms a central thread in the TRIZ methodology: People want a hole not a drill.

A number of functionally classified knowledge databases are now becoming commercially available. A free version is available at Reference 11.

Use of resources

The fourth of the five philosophical pillars of TRIZ is the simplest, and relates to the unprecedented emphasis placed on the maximisation of use of everything contained within a system. In TRIZ terms, a resource is anything in the system which is not being used to its maximum potential. TRIZ demands an aggressive and seemingly relentless pursuit of things in (and around) a system which are not being used to their maximum potential. Discovery of such resources then reveals opportunities through which the design of a system may be improved.

In addition to this relentless pursuit of resources, TRIZ demands that the search for resources also take due account of negative as well as the traditionally positive resources in a system. In TRIZ terms, even the bad stuff is good stuff – we merely haven't thought hard enough yet about how to make the transformation from lemons to lemonade. By way of an example of this 'turning lemons into lemonade' concept, TRIZ practitioners often think of resonance as a resource. This is in direct contradiction to most practice, where resonance is commonly viewed as something to be avoided at all costs. TRIZ says that somewhere, somehow, resonance in a system can be used to beneficial effect. In effect, resonance is a potent force lever capable of amplifying small inputs into large outputs. Resonance is currently being used to generate beneficial effects in a number of new product developments from vacuum cleaners (resonating carpet fibres to enhance extraction of dust particles), paint stripping systems on ships (firing a pulsed jet of water – existing resource! – at the local resonant frequency of the hull), and in helping to empty trucks carrying powder-based substances more quickly. Again, someone, somewhere already found a way of making positive use of the untapped resources in your system.

Space, time, interface

The fifth pillar of TRIZ is about perspective on problems. Our perspective on a situation plays a very important role in determining the solutions we derive. It is therefore very important to be able to look at things from many different viewpoints – not only physically and temporally, but also the relationships and interfaces between the things can be as important as the things themselves. The human brain has not evolved to be creative. It has evolved to absorb sparse data and make decisions on that data. Sometimes – as in an emergency – this decision making process has to happen very quickly. As a result, the brain very quickly makes assumptions about what a problem is and what to do about it. Unfortunately, the brain very often jumps to what turns out to be the wrong definition of the situation. The space-time-interface pillar of TRIZ is about enabling users to systematically re-frame their thinking in order to avoid the problem of jumping to the wrong problem definition.

A simple case study

In order to give a flavour of TRIZ in action and to compare the TRIZ approach with that of traditional problem solving methods, this section of the paper examines a typical manufacture quality problem. The example relates to the extrusion of man-made textile fibres. In this operation we are trying to produce fibres of as small a diameter as possible in order to produce the highest possible appearance and feel in the finished textile. We are also trying to achieve 6 Sigma levels of quality (i.e. 3.4 failures per million opportunities) during the extrusion process, but unfortunately have not been able to do so despite considerable experimental effort. The main source of defects concerns fibre breakage due to localised 'necking' – lengths of the fibre that are lower than specified diameter. The start point for this situation then is our desire to improve the quality of the extrusion process by reducing the necking problem and hence reducing the number of fibre breakages.

Once we know what we would like to improve, the next question asked in a simplified version of the TRIZ process would be 'what is stopping us from making the improvement?' The answer to this question may be that we don't know. If that is the case then TRIZ will tell us that we need to acquire some data in order to understand why in this case necking occurs. For most production processes the desire to optimise processes generally means that we will have a pretty good idea about what causes variation in the process. In the case of a typical extrusion operation quality is likely to be related to changes in temperature of the material, atmospheric temperature, size of the die, pumping pressure, tension on the fibre after extrusion, atmospheric pressure, humidity, etc. Let us then speculate that the reason for the presence of necking in the fibre is fluctuation in the temperature of the molten material before it enters the die. In traditional problem solving analysis, we might chose to explore this situation further by asking why the temperature fluctuations occur. Indeed we might take this a step further by experimenting with all of the other variables in the system to see how they might affect temperature and then necking. If we did this we might well determine that, for

example, it was possible to reduce the temperature variation problem by slowing down the process (i.e. allowing more time for the temperature to stabilise throughout the material). With this finding we now have the potential of a solution to the problem; slowing the process down improves temperature distribution which in turn reduces breakages. While this might indeed solve the quality problem, the solution has been achieved at the expense of throughput. We have improved one thing only for another to get worse. If we determine that quality is more important than speed then we may be happy with this decision. TRIZ on the other hand will tell us that we have now found a contradiction. Something gets better and something else gets worse. In the ideal case, we would find a way of improving the quality without reducing the speed. The contradictions part of the method contains a Contradiction Matrix tool (Reference 3). This tool enables users to see how other problem solvers have solved similar problems without making compromises. In the case of this hypothetical extrusion process, we have identified that there is a contradiction between our desire for even temperature distribution and the lack of time for the heat to spread evenly through the material. According to TRIZ, someone, somewhere has already found ways of solving this problem. Figure 6 illustrates how the Matrix has been used to resolve the problem in other disciplines.

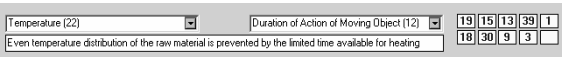

Figure 6: The temperature versus time contradiction and how other people have solved it

In this case we may see that 9 different Inventive Principles have been used to successfully resolve this type of temperature-versus-time conflict pair. Closer examination of the Inventive Principle descriptions (Reference 6) will then reveal several possible solution options:

- Principle 15, Dynamics – introduce some kind of a stirrer into the system to improve mixing of hot and cold materials.
- Principle 19, Periodic Action – rather than adding a mechanical mixer, use pressure pulsations to improve mixing of the raw material.
- Principle 1, Segmentation – instead of attempting to heat all of the raw material to the same temperature, recognise that the only time when temperature is important is when the material enters the die. Hence rather than seeking to accurately control the temperature of all of the material, segment the problem and only accurately control that material which is about to enter the die.
- Principle 18, Vibration – here we might use some form of vibration (the Principle actually suggests the use of ultrasound) to improve mixing of the material and hence the removal of hot spots.

The only limits to the number of solutions that can be found will generally be dependent on the ability of the problem solver to interpret the Inventive Principles. With practice it is possible to still be generating viable no-trade-off solutions for several hours. Compare this with a typical brainstorming session where ideas generally run out after less than 20-30 minutes.

This quality problem study has been solved as a contradiction problem since – as with many manufacture systems – there are highly likely to be contradictions present since we are always trying to get the maximum out of the system that we can. Asking the pair of questions ‘what would I like to improve?’ and ‘what stops me?’ is a simple and effective way of identifying these contradictions. An alternative problem strategy would have involved recognising that the problem has got something to do with the even heating of a liquid. Making this connection, the TRIZ function database would have suggested that, looking across every different industry, there are many ways of delivering this function. We could, for example, seek to deploy acoustic cavitations or the Joule-Lenz Effect or Ranque Effect or microwave, etc as other sectors wishing to perform the ‘heat liquid’ function have already discovered for me. If we have never heard of some of these methods of heating, the database at Reference 11 provides more information on each.

A case study using the function database

We can take this idea of looking outside our own industry sector a step further by considering recent innovations in the clothes-cleaning business. We can also use this story as

a way of making a direct connection to the concepts of ideality and value analysis.

We might start this case – as will often be the case – with consideration of the Ideal Final Result (IFR) concept. Deployment of IFR thinking begins with consideration of the benefits delivered to the customer. In this case, the function is 'clean clothes'. In the IFR scenario, this function is delivered with zero cost or harm. A typical IFR solution often features the word 'self', and in this case we might imagine that if clothes could clean 'themselves' (or, equivalent definition in TRIZ terms, 'didn't get dirty'), then we would achieve what would in the eyes of many customers be an ideal solution since it would eliminate the need for washing machines, detergents and all the other elements typically present in a laundry situation.

According to the 'someone, somewhere…' message, we ought to find, then, that someone has already achieved such a 'self-cleaning' solution. In fact a short visit to an on-line patent database will quickly reveal that many people have been thinking about such solution directions (usually not companies in the laundry business). It is often the case that if we can find someone who experiences a problem to a more extreme effect than you, then they are much more likely to have discovered a solution. In this case, we will quickly see that many systems in nature have had to solve the problem. We will also see that the military has devoted considerable resources to the problem – the logistical benefits of not having to worry about laundry, of course, makes the self-cleaning uniform a potentially significant tactical advantage.

Solving the laundry problem at this 'IFR level will very typically lead us to either the self-x based patent database searches or analysis of solutions from the natural world – where efficient use of resources is a critical survival determinant.

We might at this stage decide that the constraints of our laundry problem dictate that the nature and military solutions are too far away into the future. If we do this, then the IFR tool in TRIZ recommends that we work backwards from the IFR definition to something that does meet our constraints. Typical steps back in this instance – depending on our perspective on the value-chain – might be achieving the 'clean clothes' function with no washing-machine, or not water, or no need for dry-cleaning chemicals or detergents.

For the sake of demonstration, let us explore the 'no detergent' problem definition. We could, of course, repeat exactly the same procedure for the other potential solution directions. Again, as soon as we have hypothesised a solution direction, the TRIZ assumption is that 'someone, somewhere will already have been thinking about the problem. In this case, we can go directly to one of the TRIZ-based function databases and look up the function 'clean' to see how many other people have invented wheels in this area.

Figure 7 illustrates what we might expect to find in this list. Clearly, the world has uncovered a large array of different types of solution to the 'clean' problem. Our job at this point then becomes one of working through this list in order to identify whether any of the entries offer a higher value proposition than our current detergent solution. If we can find one, then clearly we open up the opportunity (if we are the first to do so) to generate a piece of intellectual property that could potentially introduce a sharp discontinuity to a market.

The recent introduction by Sanyo of a 'detergent-less' washing-machine based on ultrasound – one of the entries in the Figure 7 list – offers a vivid example of the kind of technology transfer made possible by this kind of TRIZ function database.

There are many other factors that will determine whether Sanyo get their overall customer value proposition right and make their ultrasonic machine a success. Other parts of the TRIZ toolkit – most likely the Contradiction tool in this case – exist to ensure that this happens. By asking what we would like to improve about the ultrasonic machine , and then what's stopping us, we identify a series of contradictions that will hopefully allow Sanyo to progressively create a more and more irresistible value proposition. A key idea in this regard is the idea of 'staying one contradiction ahead of the competition'.

The key issue at this point is that, whatever those next contradictions might turn out to be, someone, somewhere has already solved them too. And so the evolution story continues.

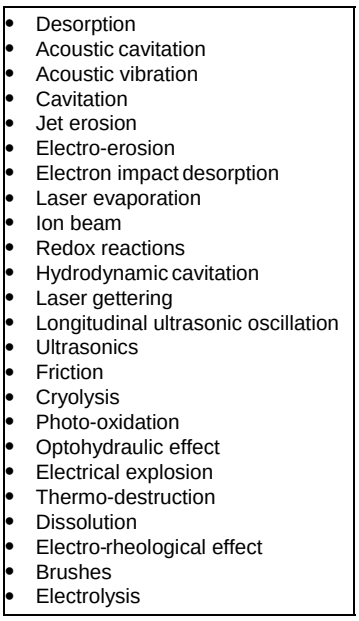

Figure 7: Partial list of entries in the 'clean' category of the TRIZ function database

SUMMARY

To try and summarize and give a flavour of the world's biggest study of creativity and innovation in a mere ten pages is an almost impossible task. For anyone that wishes to explore TRIZ in more detail there is a wealth of available information on the subject. Much of this information is available for free on the Internet. See Reference 11, for example, for a collection of over 200 TRIZ websites. Despite the fact that TRIZ will tell us that the nuclear, aerospace, bio-sciences, micro-electronics, chemical process, automotive, food, education, politics, HR, logistics, etc sectors are all solving similar problems it is still very difficult to conceive the possibility that someone has already solved your problem. But that is indeed what the evidence of nearly three million analyses will tell us. As companies and individuals gradually become more willing to talk about what they are doing with TRIZ, it becomes increasingly likely to find something specifically connected with your situation.

The main success factor with TRIZ is to get some initial tangible benefit. To learn the whole of TRIZ will probably require an investment of three to six months of effort. No one is going to (or indeed ought to) make this level of commitment without some faith that the benefits will outweigh the costs. A very important final word, then, is that there is absolutely no need to learn the whole of TRIZ before users can start delivering real benefits. Many users will learn one tool only, and will stick with just that one tool. If that enables them to solve a problem or improve customer value or create a patent then a major service will have been provided. Then and only then should the inclination to learn other parts be encouraged. Let the use of TRIZ grow from the tangible benefits that it delivers.

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THE VALUE SPACE

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ABSTRACT:

The author feels that the common perception of 'VM' is a 'value for money game' at a late stage in a project often used as a placebo to suggest fiscal diligence. However, there is a spectrum of 'Value' ranging from direct measurement through to the completely subjective. With a two dimensional cost-benefit plane for each, it defines a three dimensional "Value Space". The process of 'designing' is essentially one of continuous learning and decision making. The designer is immersed in the Value Space and makes 'value decisions' from the very start. If these decisions are based upon his own view of the world, or a limited selection of 'experts', the result will be sub-optimal and frequently a failure. Processes such as 'Value Management' need to be used throughout the project to ensure that all areas of the 'Value Space', containing the views of stakeholders, are 'mined' throughout. Notably in a professed democracy, the requirement to respect and study these values held in the community predicates the need for a skill-set that is rare in government administrations. The paper was evoked by the author's experience in helping to stop a project that would have despoiled a beautiful and ecologically unique part of China.

INTRODUCTION

In my paper to the HKIVM conference of 2002 ("Seeds of Human Fortune: the saga of “Design Methods”), I suggested some definitions:

- Design: a set of statements which describes something before it is made in reality.
- Successful Design: “the extent to which the final product made to the design fulfils the needs and values which evoked the decision to commit resources”.
- Designing: a period during which the ‘designer’ devises and experiences a process of rapid learning about something that does not yet exist by exploring the interdependencies of problem and solution, the new and the old.
- I would now add the obvious point that the designer not only learns but constantly makes decisions about ways to go forward many of which are not quantifiable but based upon "value judgements". He gets better at these the more he learns and the better the decision processes he uses.
- I also suggested that the process of "Design":
- Applies to pretty well all activities notably policies, legislation and laws and not just to a construction.
- Bore a resemblance to those of Value Management (VM) but were applied all the way through the designing and not just an 'add-on session'.

As an outsider, Value Management in a project - at least as practiced in Hong Kong - seems to be a short get-together of an "in-group" of people near to the end of the design period either because a funding crises arose or as a "placebo" delivered to the financing authority to suggest fiscal vigilance or because someone has ruled that "there shall be a Value Management Study". The two dimensions of this event are costs and benefits and it could be described as "two dimensional VM" or a "Value Plane".

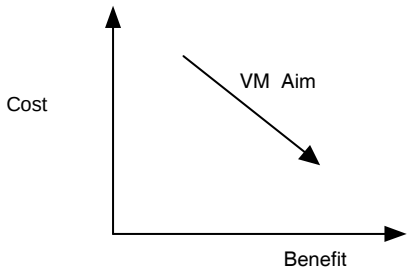


Figure 1: Value plane

Apart from these dimensions of:

- cost
- benefit

I suggest that these are at least four more issues to consider:

- values other than those that can be measured;

- time: the use of VM at all stages of the project;
- interactions between different value sets leading to higher order value judgments;
- The sources of contributions to the process;

….there could be more.

During discussion of these, I will give a few examples drawn from a real life situation in which I was recently involved and will finish with some observations about governance. In 2003, it came to light that the Hong Kong administration had been steering, through the Legislative Council committee system, a proposal to build a super-prison for 7,200 inmates. This was to be on reclaimed land next to an island, Hei Ling Chau, with a 1.5Km bridge (HK$1.5Bn) for access from Lantau island. For those not familiar with Hong Kong, Lantau is the largest mountain island in Hong Kong. Part of the North contains the airport and a new town but its southern coastal region is largely country park. Not only is the ecology unique to the south coast of China but it provides a much-needed and very beautiful 'green lung' for recreation and tourism. The population density is very small compared to the rest of Hong Kong.

The ideas in this paper were largely evoked by the manifest fragility of the basis of early decisions for this project. The basis was largely economic but also included what, in retrospect, can be seen as many 'Value Judgements'. My conclusion is that, had these been identified as such and VM, or similar processes, applied, the dominance of quantifiable money-think would not have seduced the decision makers. This would have saved the taxpayer at least HK$ 10M and avoided the 3-year delay in solving the real problem.

The same can be applied to all projects: money is much easier to quantify than many other important values which are, as a consequence, overlooked, avoided, denied or ridiculed.

THE MEANING OF "VALUE": THE VALUE SPACE

First, the meanings of the word 'value'. Reference to a dictionary shows that there is a wide spectrum of meaning ranging from an objective direct measurement through to the completely subjective matters of the values that an individual person may have in life.

In each definition, there are some key words that we can arrange in the order of this objective-subjective spectrum. I have put them into four categories but the spectrum is a continuum.

Objective and directly measured

Numerical quantity

- A measure: length, weight, time, etc.
- Worth: money equivalent: the amount of money that is considered to be a fair equivalent for something else,
- Market price: the amount of money agreed upon as an equivalent to the utility and cost of anything.

Exchangeable value. Finding an equivalent quantity

- "I will have the family jewels valued by a professional to see what they are worth"
- Relative worth, utility, or importance ‘a good value at the price’
- Quality in respect of reliability: resulting costs.

Not directly measurable

- Excellence; utility; importance
- The worth of something of value not possessing exchangeable value but whose absence leads to costs (e.g.: clean air and medical bills)
- Sustainable development: the value to a future generation.

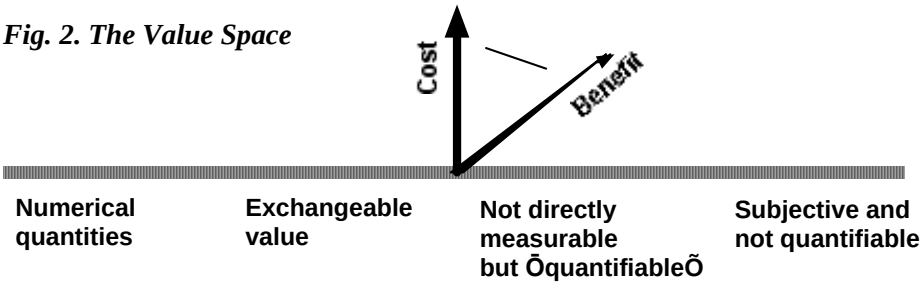
Subjective and not quantifiable

- The individual’s value of ’being’ such as a personal impact of health,
- Subjective quality. To respect, to prize, to hold dear, to have high regard for: "I value our family jewels because they belonged to my grandmother"
- Principles, standards, ethics, morals, ideals
- The subjective reaction to situations or seeing and hearing events or documents (e.g. music, art)

- Beauty.

This spectrum of meanings of 'Value' can be represented along a line. Furthermore, at each point on the line, representing a type of value, they exists the two-dimensional cost/benefit plane like the one in fig 1. These form the VALUE SPACE. (fig. 2)

Fig. 2. The Value Space



THE DIMENSION OF TIME

During the course of a design a "designer" is dwelling in this three - dimensional value - space from the very beginning. Every decision that is made is a 'value judgement' some of which are quantifiable and some are not. If the designer is an expert in the matter under design, he may be unaware that his judgements are a result of his personal paradigm (view of the world). This does not always fit the idea that the process of 'designing' is, in essence, one of learning.

It seems axiomatic that, for a design to be 'successful', all values in the value space have to be subjected to thought processes such as VM during the whole design period and not just a single session at the end. This latter practice can well turn up the realisation that the problem was incorrectly stated at the very start so creating a realisation that we are all sitting on a runaway train that nobody wants but that cannot now be stopped.

Indeed, it is even more important at the very start when a clear understanding of the problem and its surrounding factors is necessary and at the early stage of considering broad alternatives to the problem.

The extent to which this happens depends upon the extent that the designer appreciates that there are areas of the value space outwith his set of personal values: his personal paradigm. This is the mark of a good VM facilitator but is often not the appreciation of an 'expert' in a particular field. I return to this point later.

INTERDEPENDENCIES OF VALUE-PLANES IN THE VALUE SPACE

The next issue to face is that many of the value planes are interactive. Optimisation of costs and benefits in one plane could well produce sub-optimal results in another. For example, a super-prison may have been beneficial for the prison economy but it would have incurred eventual dis-benefits for the leisure and tourist economy in South Lantau. These were not seen by the 'designers'.

Two points:

- The project designer has to be sensitive to value planes other than those of his primary mission.
- There exists a higher order of judgements between value planes.

INTANGIBLE VALUES

An 'intangible value' is one that has no direct monitory exchange. Some examples of these are:

- The history of a community
- The culture of a community - both its intrinsic culture and its development
- The environs, amenity and the environment of a place
- The ecology of a place
- Old buildings.

I will draw an example from the case of the super prison project to illustrate how important is the consideration of these.

Having obtained an acceptance that a super prison was a good idea , the question followed as to where it should be sited. In the paper presented to the Public Works sub-committee, some statements were made as follows:

- . …. it is also doubtful if the public would support a prison project of such a scale at an urban location;
- Kong Nga Po (a border site) may have great potential for long term development into other uses……economic benefits with the Pearl River Delta;
- Hei Ling Chau: an isolated island opposite to Lantau. Conscious of a need for an Environmental Impact Assessment (EIA).

The value judgements in these statements are:

- An assessment of the values of urban dwellers. Resulting extensive protests would not be valued highly by public servants (correct);
- Commercial and economic value of the border site is high (debatable);
- Hei Ling Chau is isolated and, therefore, not many people will object. It is of low value. Any impact on the environment can be ameliorated (incorrect).

This provides a clear insight into the parts of the value space that were in the minds of the 'designers'. They were well acquainted with the business implications and the possibility of bad publicity from urban dwellers but were completely blind to the intangible values of South Lantau or even the hard economic value for future eco-tourism.

Eventually, these values and many others became apparent. the project was 'shelved'. Had the designer used VM from the start, the story could well have been different

The other 'value space blindness' was the wider implications for the environs. The only part of this to figure was the EIA. The reason for this was because it is a statutory requirement and such things are, of course, very well appreciated in the value space of a bureaucrat.

Perhaps the lesson is that, instead of statutory assessments limited to the one value plane of the environment, there should be a statutory requirement for an assessment of all values in the Value Space and a requirement to determine what they are before embarking on any design venture.

Before leaving this topic, I would like to mention the concept of 'vulnerable values'. There is a strong body of opinion that believes that the free market economy is the solution to everything: people will pay for that which they value . There is, however, a modifying opinion that this is good as far as it goes but it falls down when it comes to values that are difficult to quantify and would not form the basis of a profitable business..

These are such things as:

- The preservation of a society's culture and history;
- Cultural activities that do not make 'good business': libraries, music, theatre, TV programmes etc.
- Sustainable development: regard for future generation that are not present-day consumers.

The vulnerability arises because they may not be sustainable by the free market with a result that they vulnerable to extinction.

THE 'SUBSTANCE' OF VALUES

So far, in this paper, I have suggested that value management should embrace a wider spectrum of values than simply those that can be measured and that the process be applied from the very start of a project as the basis of decision-making throughout.

But we cannot talk about values as if they exist on their own and float around in the air. 'Values' are all in the heads of people: they are ideas, beliefs and tenets created by the life experience of each person. Some of them may become 'group values' and be written down but they are still essentially 'of people' . Many people live and die for their values.

So the last dimension relates to the people who embody each element of the Value Space. Without them, there is no space. Without recognising this, the designer simply invents his own space with his own values or those out of books.

To quote the definition of the activity of "designing" again:

"A period during which the 'designer' devises and experiences a process of rapid learning about something that does not yet exist by exploring the interdependencies of problem and solution, the new and the old."

For a designer to maximize his/her learning, the central requirements are:

- That he realizes he is learning and that he does not know everything already nor understand the values of the people for whom he is designing. (perhaps the word is 'humility')
- The widest range of sources available from which to learn from. This means people who embrace the widest possible broadest spectrum of paradigms and values.

Now, adulation of 'the expert' is well embedded in our culture and we are very thankful for it when the application of the latest knowledge is desirable . But, during the design process, it is necessary, for the best outcome, to dwell in the whole Value Space and not just the sections in which the designer is knowledgeable. It is never entirely possible to assume that another part of the space not relevant.

This matter is well dealt with in a recent book "The Wisdom of Crowds" . In Chapter 2: "The difference makes: waggle dances, the Bay of Pigs and the value of Diversity", the author deals with the poor performance of expert groups versus mixed groups. It is a subject too vast to be dealt with here but I give some quotations from it in the Appendix to whet your curiosity.

THE APPLICATION OF "VALUE SPACE" TO GOVERNANCE

This paper was evoked by an insight into the manner in which projects come to life and move forward in the Hong Kong administration. Whilst the conclusions are applicable to all projects, the question of 'values' has more far-reaching implications when it comes to the processes of governance.

In the Hong Kong government, the lead 'designers' of specific policies and formulating proposals for large projects, are members of the 'Administrative Officer' class. This cadre was created in the 1830s within the British government to replace the 'patronage system' in which friends and relations filled government. The new system was founded on the concept of a division between what it called 'technicians' (who we would now term 'professional' or 'experts') and the policy makers.

The essential part of this was that policy should be the province of the broad-thinking 'generalist' and not the experts who were considered to have a limited field of view. This shows that the authors of the system appreciated the fundamental point of the Value Space: 'designers' must be able to take a broader view than that of the 'technician' in any particular field.

This resulted in the 'gentleman-amateur' administrator that matured into the present-day Administrative Officer (AO) cadre. Very few candidates from the professions have been accepted into the ranks of the AO over the years and the system has been substantially the same for the last 150 years.

The concept behind this is very sound and it was reasonable successful. It bred some very fine administrators but also, by its very nature, some very arrogant ones. However, today, there is a considerable body of evidence and opinion that the system no longer works.

The many reasons for this would fill another paper but the ones most relevant to discussing 'Value Space' are:

- In an ever increasingly complex world, the 'designers' are people generally ignorant of the matter in hand and the experts have become more and more narrowly focussed on a fewer value plane;
- The designer element holds the 'structural' authority (power) whilst the later has a narrowing 'sapiental' authority (wisdom).
- This imbalance of 'power' and 'wisdom' means that those with wisdom exercise self-censorship in the interest of their careers with the result that there is an unhealthy lack of criticism between the players . Facilitated 'brainstorming' to generate ideas is not 'in the book'. Rather, there are meetings of 'those concerned' chaired by the person with the most power - or his/her representative - with predictable outcomes.

These and other issues are now ingrained in our management culture. Trying to change it by 'training' and palliative measures is useless -- people revert. The only solution is to find a completely new approach - both in thinking and in organisational structure.

THE STRUCTURE OF 'GOVERNANCE BY VALUE'

The foregoing leads to some fairly obvious conclusions about management in general and governance in particular. I will finish by suggesting how any government might do better by using the Value Space. I suspect that it will not catch on overnight!

The PVA.

A new cadre is required with a name something like 'Project Value Analysts' (PVA). In the Hong Kong context, most of the AO cadre could be trained to do this. The first, essential, requirement is that they would have no structural authority but are required to undertake specific project steps that includes, above all else, ways of harnessing the 'wisdom of the crowds'. They would be required to adopt the totally independent 'generalist' view of the whole scene - rather in the way it was probably intended in 1830 - to ensure that all ideas received a fully critical appraisal from people dwelling in all parts of the Value Space.

The organisation structure

The interdependencies of value planes suggests an organisational structure. Above the PVAs, there is a need for a level of authority to deal with the higher level value judgements arising from conflicting value planes. Finally, above that, there is the top level that sets the social 'vision' within which the judgements are to be made. Three levels!

Inputs to the design work

The other essential part of the system is the inclusion of 'the crowd'. This could be achieved by:

having the elected representatives becoming facilitators of his electorate

ensuring that he is included in the PVA's processes.

Introducing a genuine' public consultation' process based upon facilitated meetings including techniques such as 'Open Space Technology' or 'Word Café' for large public groups.

Inputs to the social vision

As suggested above, the job of the top person in the structure is to make the ultimate decision when there is a conflict between value planes at the highest level.

In order to do this, he must have already created a vision of the society he or she is governing.

In many societies, this is usually the top person of the elected political party who should have got there by virtue of a policy manifesto for which he persuaded the electorate to vote. Many people hold that this is the only way of creating a 'democracy'. However, it seldom works in this idealistic way.

Plato said a lot about the wisdom of kings.

I suggest that, rather than having loads of expertise, kings should be wise mainly in one thing: the Value Space - and use it fully. That way, we might achieve a democracy!

nual General Meeting was organised in the Hong
and guests. The President's report and Treasurer's
members present. The election of council members
www.hkivm.com.hk/contact for the updated list of

FORTHCOMING EVENTS

- **4-7 June 2006**, SAVE International's 46th Annual Conference **Managing Projects to Maximize Value** will be held at the Savannah Marriott Riverfront, Savannah, Georgia, USA. Please visit http://www.value-eng.org/2006conference/details.php for further information.

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THE VALUE MANAGER is the official publication of the Hong Kong Institute of Value Management. It intends to provide a lively forum and means of communications for HKIVM members and those who are interested in VM. To achieve this objective, we need your support by sharing with us your articles or comments. The following are the notes to contributors:

1. Articles submitted to the journal should fall in one of the following categories: New VA/VE/VM techniques or methodologies, Review of conference VM papers, VM case studies, VM research trends and directions, Reports of innovative practice.
2. Papers or letters should be submitted on a 3.5" disc for IBM PC and A4 hard copy. Discs will be returned to authors after editing. Figures, if any, should be sent separately, in their original and preferred sizes. The length of each paper should be around 1000-1500 words.
3. The preferred software for processing your article is Word, other packages are also acceptable. If the above word processing package is not available, please find a computer with scanning capabilities; the typewritten copy can be transferred to a file as specified.
4. All articles and correspondences should be sent directly to The Editor, Prof. Geoffrey Q.P. Shen, c/o Department of Building and Real Estate, The Hong Kong Polytechnic University, Hung Hom, Kowloon. Tel: (852) 2766 5817, Fax: (852) 2764 5131.

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Member (MHKIVM) This classification is available to individuals who can demonstrate an acceptable level of knowledge and experience in the field of Value Management. For admission, details on the Application Form are to be completed and copy of CV outlining professional employment, experiences and value management background enclosed. **Value Management Background** incorporating details of VM training and courses in VM process, application and techniques, number of studies, types of studies, role in process, days and dates should be stated clearly in the CV.

Associate Member The Associate Member classification is available to any individual who can demonstrate interest in the objectives of HKIVM, but may not have had sufficient Value Management experience to qualify as a Member.

✂ -

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