

PARADIGM-BREAKING BUSINESS CONCEPT INNOVATION USING TRIZ AND OTHER TREND PREDICTION TOOLS

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ABSTRACT

Business concept innovation (BCI) is the process of re-inventing the way organisations conduct their business. It is being cited as THE major success factor that will determine whether organisations will be successful or not in the current economic climate of rapid change and major uncertainty. At this point in time there is no theory underpinning how organisations should actually 'do' BCI. The paper describes how derivatives of the technology evolution trends uncovered by TRIZ researchers are being combined with customer and market evolution trends to provide organisations, for the first time, with the framework of a systematic business concept innovation methodology. The paper illustrates the new capability through a number of real world case study examples.

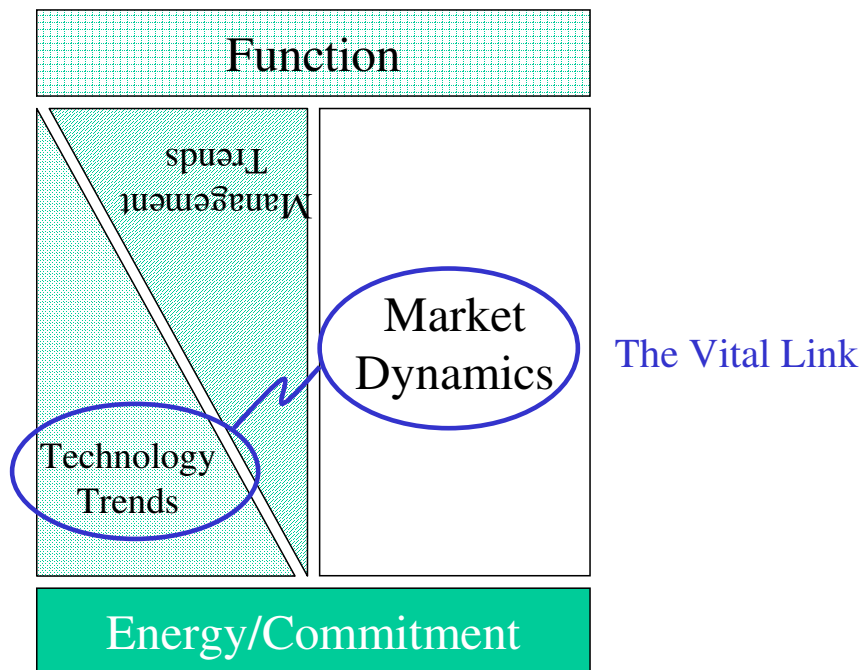
INTRODUCTION

Business concept innovation (BCI) is the process of re-inventing the way organisations conduct their business. It is being cited as THE major success factor that will determine whether organisations will be successful or not in the current economic climate of rapid change and major uncertainty. At this point in time there is no theory underpinning how organisations should actually 'do' BCI. The paper describes how derivatives of the technology evolution trends uncovered by TRIZ researchers are being combined with

customer and market evolution trends to provide organisations, for the first time, with the framework of a systematic business concept innovation methodology.

The paper combines TRIZ findings with the work of leading BCI proponents (1, 2) to demonstrate how TRIZ trends can be used to identify not only the ‘what’s, but the ‘where’ and ‘when’s of new ways for organisations to conduct their business. The five crucial elements making this capability a practical reality are the TRIZ evolution trends and corresponding understanding of the evolution towards ideality, their business/strategic equivalent evolution towards ‘free, perfect and now’, recognition of useful functions, understanding of the factors and dynamics that determine innovation timing, and last and most important, the will, energy and commitment to see the innovation through to a successful end – Figure 1.

Figure 1: Five Essentials of Successful Business Concept Innovation



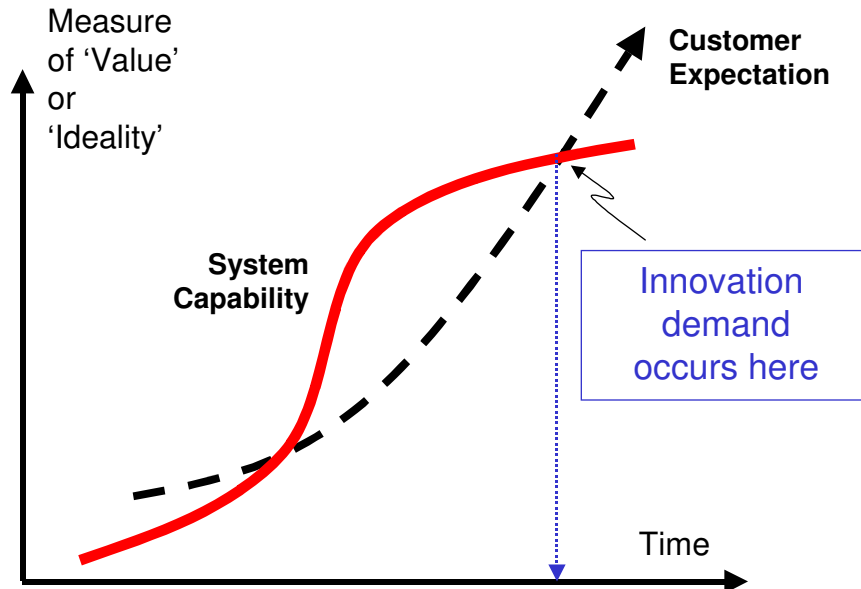
In placing the will, energy and commitment essential on one side, we record that the predominant influencing factor in business evolution direction is determined by whether the prevailing technology evolution precedes or lags behind customer expectations. Where technology lags behind customer expectation (as in many service industries or the design of many household products), the paper shows that the existing TRIZ technology trends can be expected to play a major role in bridging the gap. Where technology evolution exceeds the expectations of a significant number of customers – as may be seen in a large number of case studies by Christensen (2) such as computer hard-drives, earth-moving equipment and accounting software – and the market becomes ripe for the emergence of ‘disruptive’ technology insertions, the paper shows how modified definition and application of the TRIZ trends can also be used to develop potent BCI solutions. We unfold the emerging BCI methodology through a series of case study examples.

Technology Lagging Behind Customer Expectation

Previous articles in TRIZ Journal have discussed the subject of innovation timing (3). The picture reproduced in Figure 2 serves to illustrate the frequently observed scenario in which the fundamental limitations of a given solution become overtaken by customer expectations. This situation results in an ‘administrative contradiction’ – the customer knows what they want, but the system is unable to deliver it. This inadequacy of the system relative to expectation is a vital innovation driver – and represents a significant element of the ‘form follows failure’ thesis found in Henry Petroski’s excellent ‘The Evolution of Useful Things’ book (4).

The characteristic of the customer expectation curve follows the trends suggested by the Kano diagram and the inevitable shift of customer expectations as they become more familiar with products. The Kano model tells us that while we used to be excited by the idea of air-conditioning in a car, for example, we now almost take it for granted that the car will have this facility. In a similar manner, the idea of in-car GPS is still seen as an ‘exciter’ – something that would actively delight us when we see it in the car. The rising characteristic of the customer expectation line in this scenario (and reference 3 records that it is particularly dominant in e-commerce based businesses) is in direct conflict with the inherent limitations created by the s-curve characteristics of a system.

Figure 2: Common Innovation Driver I – Customer Need Exceeds Solution Capability



The expectation curve and the system capability s-curve are of course plotted as averages. Particularly in the case of the customer expectation curve, this is a highly dangerous assumption. The TRIZ management trend regarding market segmentation suggests that organisations will increasingly have to plot these expectation pictures for every individual customer (leaving one or two important mass-customisation contradictions to

be solved along the way!) if they are to truly understand the dynamics of when the innovation demand occurs.

The emergence of the administrative contradiction in this ‘expectation exceeds technology’ scenario meanwhile acts as the spur to innovation. The flattening of the top of the s-curve is symptomatic of the presence of a limiting contradiction in the system. The creation of a new or modified system that enables this s-curve to be lifted – i.e. presents the customer with sufficiently high new level of ideality or value – will only come about through resolution of a contradiction. This can be achieved through use of the Contradictions part of TRIZ, or, using the Trends of Evolution – where, although over-simplistic – it is possible to say that each new step along the trend patterns is a new s-curve opportunity.

In this ‘expectation exceeds capability’ scenario, then, it is evident that the innovation-timing question is answered by a definite ‘now’.

The real key to identification of this scenario is finding the administrative contradictions where the customer expectation is hidden from view. A good example of this is the recent emergence of pizza-boxes which are better able to keep delivery pizzas warm – this following probably close to 10 years of customers apparently ‘accepting’ the fact that the pizza that arrived on their doorstep was cold.

The two most useful tools to help identify these ‘hidden’ dis-satisfactions are QFD and a variant of subversion analysis in which we might use provocations of the form ‘how could a customer be unhappy with this product?’ or ‘who doesn’t buy our product, and why?’.

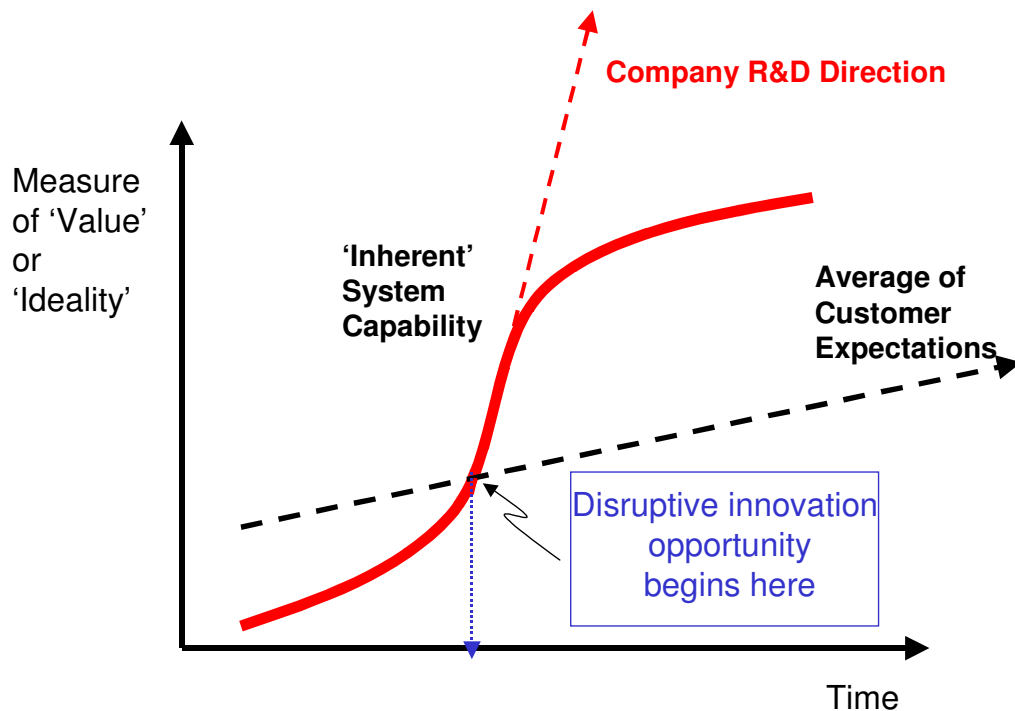
Technology Exceeds Customer Expectation

Our thrust in this section now shifts to look at a different scenario connecting customer expectation to solution capability – that of the case where solution capability exceeds customer expectation (Figure 3). This scenario is the basis for much of the work reported by Clayton Christensen in the essential ‘Innovator’s Dilemma’ book (2).

The central thrust and paradox of the Innovator’s Dilemma is that traditional ‘good’ management practice can lead organisations into big trouble when the solutions they offer **exceed** the needs of their customers. In Christensen’s words, these situations lead to opportunities for the entry into the market of ‘disruptive’ technologies. A disruptive technology is essentially one which changes the prevailing business model. Historically speaking, companies almost inherently fail to thrive (or often even survive) in situations where the market is expecting less of a product than it is capable of delivering.

One of the aims of this paper is to encourage readers to think about possible disruptive technology opportunities or threats in their business, and, more importantly, to show how the TRIZ technology evolution trends are uniquely placed to help determine what the ‘right’ disruptive jumps might be.

Figure 3: Common Innovation Driver II – Solution Capability Exceeds Customer Need



Case Study – Earth-Moving Equipment

In realising that probably not all of our readers are interested in heavy earth-moving equipment, we hope that everyone can nevertheless extract some useful learning points from this discussion. Those that feel happier thinking about computer disc-drives or accounting software or retail shopping or electric cars might like to explore the details given for those cases given in Christensen's book and see the uncanny parallels to the earth-moving equipment case illustrated here.

Christensen details the evolution of earth-moving equipment from the original steam-driven mechanical devices of the type illustrated in Figure 4 to the hydraulic machines prevalent in today's earth moving environment. The introduction of hydraulic machines was indisputably 'disruptive' to the mechanical excavator business model.

To over-simplify grossly (and yet hopefully justifiably), the evolution of mechanical excavators was largely driven by the manufacturers (initially correct) belief that their markets were interested in moving ever greater amounts of earth per shovel load, and that this was particularly so for their most profitable customers. Consequently 'sound' management practice meant that the evolution of mechanical excavators was targeted at the earth-moving needs of the most profitable customers. As time went on, the industry found that it was possible to make bigger and bigger machines capable of moving more and more earth.

Figure 4: Mechanical Earth-Moving Equipment – Using Cables To Transmit Loads



Further evolution of the earth movers to increase shovel load size, however, although serving customers at the high end of the market began to exceed the requirements of other customers to whom shovel size increase was not worth the increase in cost and other down-sides that came attached to such big machines. These customers were becoming ripe for a disruptive technology insertion.

They got one when JCB introduced the first hydraulically powered earthmovers in 1947. The first hydraulic ‘backhoes’ were inferior to the cable-actuated mechanical machines in just about every traditional performance measure used by the existing customer base: to these (high profit generating) customers the new machine was not particularly attractive. On the other hand, the new machines did offer a considerable number of new advantages, not least of which was a whole new level of compactness, portability and flexibility of operation, and a marked improvement in safety if something went wrong.

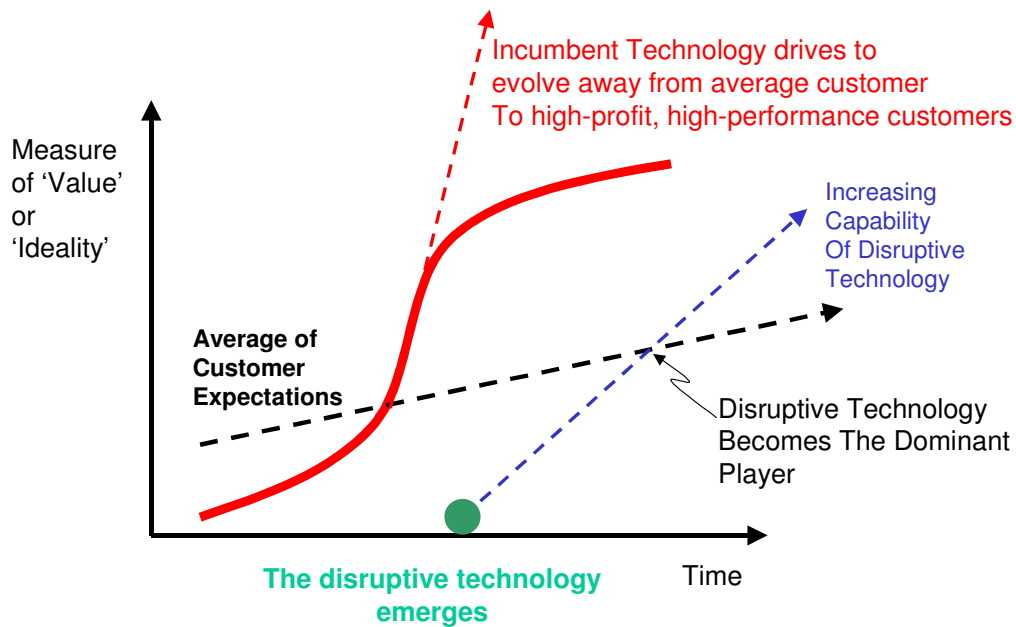
The new hydraulic machines thus carved themselves a whole new market of customers to whom the new advantages outweighed the deficiencies of a smaller load carrying capability. The new machines began to sell in large quantities, but principally to a newly created customer base.

As is so often then the case, the revenues from this new customer base (albeit they were still not sufficient to be of great interest to the established cable-activated machine manufacturers – hence ‘good management practice’ said to ignore them) funded the development of increasingly capable hydraulic systems. The hydraulic machine evolution entered a phase where it was able to rapidly catch-up with the performance capabilities of the mechanical machines. It did this whilst simultaneously preserving the advantages of compactness, portability, flexibility and safety. In another highly reproducible evolution pattern, the increasing capability of the hydraulic machines was happening at a rate

greater than the changing requirements of the customers with the highest earth-moving requirements. Before too long the net value of the evolving hydraulic machines thus met and exceeded both the customer expectation and the fundamental ideality limits of the mechanical machines – Figure 5. As is so often the case, the disruptive technology eventually won the day – and today the mechanical, cable actuated earthmovers are restricted to very small niche applications.

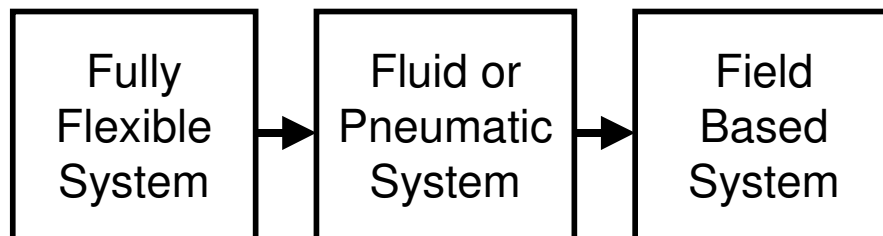
The connection with TRIZ here is that it helps predict the evolution of systems, and in this case, specifically suggests the evolution from mechanical to fluid-based systems.

Figure 5: How The Disruptive Technology Overcomes The Established Technology



The trend (Figure 6), in other words, could have been used to predict the eventual dominance of the hydraulic systems over the mechanical. The trend, however, doesn't end with the hydraulic system; it suggests that these will eventually be overtaken by field-based systems;

Figure 6: Partial View of TRIZ 'Dynamization' Trend



Seeing as the hydraulic backhoe (Figure 7) is the currently dominant earth-mover, we might now switch from historical analysis to future prediction mode by using the TRIZ

trend alongside Christensen's disruptive technology model to have a go at showing what both together would tell us about the future of earth-moving:

Figure 7: Present Day Backhoe Earth Mover



Field-Based Earth Movers

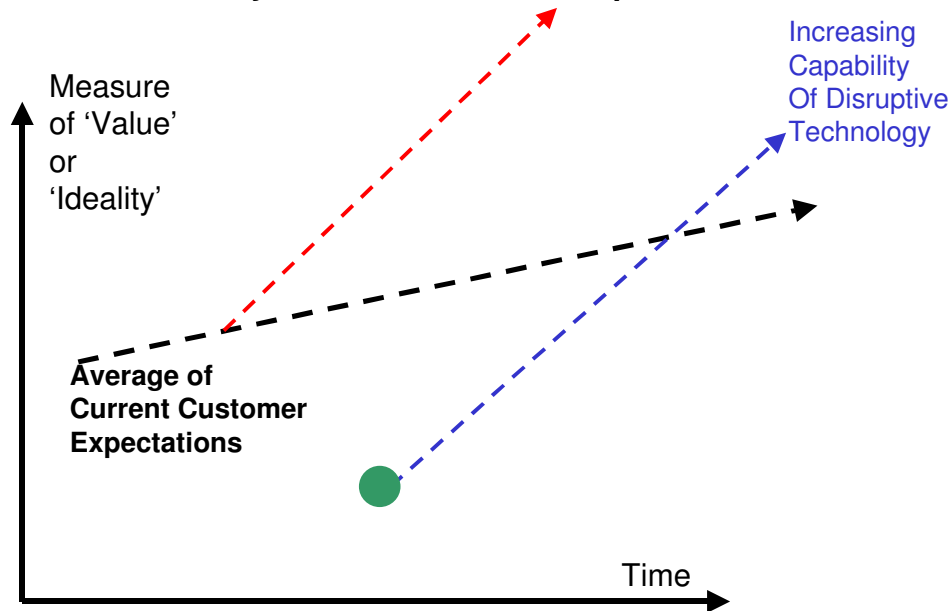
As described in the Reference 5, the reasons systems jump from fluid to field based solutions are various – increased reliability, increased design flexibility (positioning of components), increased efficiency, increased controllability, increased safety, reduced harm from leaks, etc.

As far as load-carrying capability is concerned, however, an electrically actuated backhoe using the best of today's electrical actuation capability will not match the earth-moving performance of the hydraulic systems. The current customer base is thus unlikely to be attracted to an electrical machine.

According to the disruptive technology model, the new electrically based earth mover needs to find a new customer base to whom shovel load size performance is not as important as some of the inherent benefits of shifting away from hydraulics if it is to define a foundation from which to grow. Almost inherently, these customers don't exist today, or, if they do, they are highly unpredictable in terms of what they actually want. Hypothetically, for an electrical earth-mover, they might include a growing market of domestic users (see how the market for sit-on lawn-mowers evolved for example), or anyone requiring to dig lots of small holes with as little human labour as possible – e.g. cable companies – where the increased controllability and flexibility (i.e. the tool needs connecting to the power source by a simple wire only) of an electrically operated system would outweigh the reduced shovel-load performance. According to the model, these applications will in the short term be less profitable than the high performance hydraulic systems (which explains why the incumbent hydraulic companies are unlikely to be interested – at least based on historical evidence).

The next part of the prediction then goes something along the lines that because the electrical system is at the start of its evolutionary potential path, it doesn't need nearly so much investment to begin increasing the performance of the machines. Revenues from the new customer base fund development of higher shovel load systems; the electrical systems will then eventually become able to match the performance of the hydraulic systems, while retaining the other flexibility, controllability, reliability, etc advantages the hydraulic systems will never match – Figure 7.

Figure 7: Disruptive Technology Wins Because Technology Evolution Commonly Exceeds Customer Expectation



Eventually, the electrical systems will achieve the performance capabilities of the hydraulic systems, after which point, the days of hydraulics will be numbered.

THOUGHTS

Disruptive technologies usually 'win' because technology performance capability often rises more quickly than customer expectations.

The disruptive technology is highly likely to be initially inferior in terms of the traditional performance measures of the incumbent technology. The disruptive technology thus usually has to find a new customer base to sustain it in the initial development stages.

The new customer base is unlikely to match the profitability of the existing market in the short term. 'Good management practice' thus means the existing companies will not exploit the new technology (NB Christensen's book offers strategies to remedy this problem – albeit they are almost inherently painful and come attached to a short term drop in profit.)

The cycle repeats every time an established technology ‘grows’ away from the evolving customer requirement.

When a customer’s appetite for ‘performance’ is sated, they will increasingly make purchase decisions based on reliability, convenience and price – we will return to these areas in future newsletter articles.

In the meantime, the major point of this paper is to implant readers with the vital connection between the disruptive technology business model and the TRIZ evolution trends. It is highly likely that the form of the disruptive technologies can and will be predicted by TRIZ. Almost the absolute key to successful business concept innovation in this ‘technology exceeds expectation’ scenario is the identification of the new markets (and new players) that will suit the apparently ‘inferior’ disruptive product.

The Christensen example of electric cars being more likely to emerge from the industries making golf-carts and milk-vans rather than any of the big car manufacturers is particularly apposite in this BCI scenario. The more organisations look outside their current self-imposed boundaries, the more likely it is that they will identify the threats, and (in the case of the golf cart manufacturers) opportunities awaiting those who can spot the discontinuities. Reference 7 discusses this side of the equation in more detail.

To a large extent, four of the five essential elements of successful business concept innovation – technology trends, business trends, function and market dynamics are all in place. Whether the same will one day be able to be said about the fifth element is more debatable.

Final Thought - Relationship to TRIZ

It is perhaps interesting to examine TRIZ in the context of this ‘disruptive technology’ model. In many senses, in the West, TRIZ presents a richness that is considerably in advance of the expectations of most organisations. Whether this apparent ‘over-capability’ of TRIZ is genuine or due to the mis-selling and poor placement by the TRIZ community, it is not surprising to see the emergence of simplified versions like SIT. The community would do well to heed the warnings of the Christensen model.

REFERENCES

- 1) Hamel, G., ‘Leading The Revolution’, Harvard Business School Press, 1999.
- 2) Christensen, C.M., ‘The Innovator’s Dilemma: When New Technologies Cause Great Firms To Fail’, Harvard Business School Press, 1997.
- 3) Mann, D.L., Domb, E., ‘Using TRIZ to Overcome Business Contradictions: Profitable E-Commerce’, TRIZ Journal, April 2001.
- 4) Petroski, H., ‘The Evolution of Useful Things’, Vintage Books, 1994.
- 5) CreaTRIZ V2.1, Advanced Trends Tab, www.creax.com
- 6) CREAX Newsletter, ‘Problems and Opportunities’, www.creax.com/newsletter, October 2001