Technosocial Competition

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Published in The TRIZ Journal, February 1997.

"Until the beginning of 1990s, worldwide competition was simple; manufacturers of "more, cheaper, and better" products win... Nowadays, however, competition is not like the good old days. We must be able to achieve quicker delivery of more innovative products.", wrote Professor Tetsuo Tomiyama of Tokyo University in his article "A Japanese View on Concurrent Engineering". This interesting point highlights what drives today's and tomorrow's product manufacturers. And of course, those who are aware of TRIZ, especially TRIZ-based commercial services will definitely like this trend.

It looks like evolution of modern society has reached the point where so-called"technosocial competition" comes to arena. This is not social competition between people and not technological competition between corporations: this is something different. As a matter of fact, this is a competition to develop technology which makes the person's life more comfortable, productive and better. Recently I have noticed that I tend to buy a new photocamera every two years. Why? Because of two factors: first, I know the new camera can do better shots and second, I can afford it. Corporations have probably recognized these two factors faster than me. And those who did, would definitely win over my savings...

Today, technologically developed and wealthy societies are ready to invest in improved products more and more, and the value of product costs becomes less important than quality. But how can manufacturers quicker develop innovative products? Using mathematics or logics? Or something totally different - brainstorming? Logics is useless unless we have something to reason about. Brainstorming is nothing but chaotic scanning of associations that too heavily relies on personal creative capabilities. To develop new products corporations are in desperate need for new knowledge. This is the point where TRIZ comes.

TRIZ success is and will be based on a very important factor: this is a knowledge-intensive method.

Knowledge Is Power

In mid-eighties long-promised Artificial Intelligence declared domination of knowledge over logic after heavily invested research divisions had failed to createintelligent machines on the basis of implementation of purely logical schemes.

There is an interesting analogy: have a quick look at the evolution of soundcards we use in our computers. We type in notes, they produce music. First generation of soundcards used synthesised sound. Developers wanted to simulate natural sounds by creating complex algorithms for sound synthesis using modulation of artificially created tones. And even the best synthesizers could not achieve quality and richness of sound comparable to natural instruments. But the second generation of soundcards tackled this problem: instead of synthesising sounds, they used prerecorded sound samples of various musical instruments stored in memory chips and played back the samples accordingly melody given. As a result,

we have virtually perfect sound, and I am not even sure a music expert is able to distinguish between natural sound and sound played by the computer.

Let us make a brief analysis. In the first case, we have a very complex algorithm and a small set of data. And we have sound which is far from natural. In the second situation, we have a very simple algorithm and a very large collection of sound samples. And we have perfect sound. But just having a collection of samples is not enough no matter how large it is. To create music we need to apply specific patterns, notes combinations must obey certain rules --- otherwise we will hear something awful. In other words, we need systematic use of our sapmples collection.

This analogy is probably, very rough. But as seems to me it perfectly illustrates what TRIZ means to engineering. TRIZ is not just a sorted collection of patent excerpts and a bunch of inventive principles. TRIZ possesses powerful tools which help to use previous inventive knowledge in systematic way. Knowledge systematization that provides fast and structured access to the needed knowledge -- this makes TRIZ so powerful. An engineer's brain is another knowledge collection and TRIZ helps to systematically use this repository too. TRIZ is effective because a "collaboration" between the engineer and TRIZ produces "system effect" known in TRIZ: by integrating two systems we obtain a new feature which does not belong to any of two systems taken separately. This new feature is new knowledge.

By analogy with souncards, it seems that there is no need to wait until researchers will find a universal formulae of creativity once we have TRIZ.

Fundamental TRIZ

Sometimes I am asked the question: "What about fundamental research in TRIZ? Why do we need to invest if we have a tool which gives us all what we need?". Well, as it seems to me, I am completely satisfied with my camera now. But I am completely sure that in two years I will part with my money again - there will be conceptually new cameras at the market. They will evolve. So will every aspect of TRIZ that has proven itself to be successful.

Let us have a look at fundamental TRIZ from the position of one of TRIZ trends of technology evolution: trend of "composition-decomposition". Modern TRIZ is segmented into several parts: principles for contradiction elimination, trends of evolution, pointers to scientific phenomena, substance-field analysis, functional analysis. There is nothing strange that every TRIZ part evolves independently. But the trend of "composition-decomposition" indicates that sooner or later these segments will integrate.

Those who know basics of TRIZ have probably noticed my mistake: whe listing the TRIZ components, I intentionally forgot to mention the Algorithm for Inventive Problem Solving. Because this was the early attempt to create such "integrated TRIZ framework". The attempt did not fail. Today, ARIZ is the most powerful TRIZ tool. But when I teach TRIZ to engineers or students I even do not introduce it. Why? Because ARIZ is very hard to learn. It is not like learning mathematics or physics at school. The major disadvantage of ARIZ is that it is, unfortunately, inconsistent: data obtained at earlier steps of the algorithm do not smoothly and fully incorporate into later steps. Too much extra knowledge is needed to use ARIZ, and the engineer may loose his head trying to establish all needed relationships between the algorithm and his problem.

Why does this happen? A world of artificial systems is very complex and large. To solve our problem with ARIZ, we need to build a model of a product we want to improve. But since all products are too different, model of another product will be different too since it will incorporate other components and links between them. But we need the same models in both situations because most likely we will have apply the same TRIZ technique to solve both problems. TRIZ offers two types of models: contradictions and substance-field models. Unfortunately, they are highly abstract. As a result, we have a contradiction: the more abstract our problem model is, the better it fits the existing problem solving method. On the other hand, the more abstract problem is, the more data we lose.

I would like to predict that "composition" phase will come after eliminating this contradiction. Once TRIZ researchers will be able to agree upon what model to use to represent data and knowledge about different products in uniform way and without losing informational contents, TRIZ will be able to come up with a new integrating framework. Having some experience with trying to tackle the problem of uniform modeling, I must admit that it will not happen very soon.

In the meanwhile, a problem with handling great amount of knowledge and data will not be a big problem - we will have smart computers. Today, even personal computers are powerful enough to store all knowledge of the world. The question is not "how much", the question is what and how to store?

Smart Computers

Knowledge-intensive approach to design means that a large amount of knowledge must be processed smartly. Modern TRIZ-based software packages (such as Invention Machine (tm) by IMCorp, MA) are good examples of interactive systems which guide a designer along a path leading to a solution. But both knowledge of TRIZ and specific problem are processed by the designer, and he performs most of reasoning. On the other hand, Artificial Intelligence promises to provide us with "automated reasoning systems". I have nothing against AI (I have been working with it for last five years) but frankly speaking, this combination of words somewhat frightens me. What I personally would like to have at my desktop - a collaborative computer.

Collaborative computer software based on TRIZ should not be fully automated. I want it to guide me, just as it does now. In addition, it will be able to correct me if I do something wrong. It will be able to understand my problem. It also will be able to establish missing links if I miss something. It will give me knowledge that I need right when I need it. Its knowledge base will store not only TRIZ principles, but also fundamental and more specific knowledge of science and engineering. We know how hard it is to formulate inventive problems. After entering a sketch of the problem into the computer the system will be able to find a previous similar case by analogical reasoning and produce recommendation - but in terms of my problem! And, finally, we both will speak the same language.

Here I must make a comment: all what I am speculating about is not science fiction. All this is theoretically possible. Today, collaborative computer systems are already known - they communicate with the user through so-called "intelligent agents". They are quite simple, operate within narrow domains, but all new takes some time to grow.

TRIZ Wins Over

In the next millennium, which will probably accelerate technosocial competition, TRIZ-based methods and other design tools that will incorporate TRIZ fundamentals will become crucial for every company involved into new products development. Training in TRIZ-based methods (no matter what name they will have) will be provided by universities and colleges. To make a story short, TRIZ will take a very strong position in engineering and design communities.

Why do I dare to make such a brave prediction? Because TRIZ resolves the fundamental contradiction of technosocial competition: more value for less time. No other method can do the same as good as TRIZ.

However if we neglect certain aspects in the of TRIZ evolution, such as, for instance, fundamental development, we will do harm to it. But I hope it will not happen. Because we are those who know TRIZ, that is, we must think systematically too.

But there is still one question I do not want even to think about: what will happen with my savings if conceptually new cameras will appear every month?