POWER THINKING SKILLS FOR INNOVATIVE LEADERSHIP

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In the past, starting up and maintaining a new business was if not easier but much more secure: we could invent something or produce a great business idea only once and enjoy obtaining benefits from them throughout the rest of our lives. But today we live in a different world. Today we need to continuously innovate if we want to maintain leadership – either we want to lead business or people. It means that we need to develop and possess relevant thinking skills to be able to constantly come up with new winning ideas. But what are the differences between “regular” and “power” thinking skills?

Due to nature of my work which focuses on front-end innovation training, consulting, and coaching, I have had a unique chance to meet many great people: business leaders, thought leaders, inventors and innovators from different areas - technology, business, politics, arts. Below I would like to summarize 14 differences based on many years of observations. Certainly, there are more differences. However my goal was to identify most universal, important and influential ones which form entire categories of differences.

1. Multi-Screen Thinking vs. *Tunnel Thinking*

In most cases, when we attempt to solve a problem, we usually focus on a very narrow spot or an area where the problem takes place. As a result we limit ourselves to considering only those components that immediately form the problem. However, looking at the problem from the viewpoint of its relationships with a rest of a system where the problem has arisen helps identifying much broader scope of opportunities, better understand roots and history of the problem, and identify different strategies of solving the problem at different levels. Thus, we should always try to see a problem as a part of a bigger system and also recognize how our future solutions to the problem will impact the future of a system and its environment. When we want to innovatively improve a certain system – technical, business, etc., - it also makes sense to look back to the past to find out what changes the system experienced and what were key drivers of these changes.

Viewing a problem or a system under different angles also helps to recognize different types of solutions and evolution strategies. ("Multi-Screen Diagram of Thinking" is one of the key TRIZ[1] components, also known as "System operator", or "9 Windows".)

2. Abstract Thinking vs. *Specific Thinking*

Specific thinking forces us to stay at the level of details within a scope of already known solutions and concepts and try to adapt them to our problem. As a result, we either stuck or come up with small incremental improvements. Abstract thinking helps to migrate problem solving to a new level and to fight psychological inertia which is produced by specific information and terms provided by either specific situation we deal with or by our knowledge, experiences, and mental associations accumulated and formed during our lives. Getting abstract also helps to recognize analogies in totally different areas and establish connections between seemingly non-related things.

For instance, when we say the word "wall", we usually imagine a wall of a house made of bricks or stones. However, if we replace the word "wall" with the word "barrier", we expand a space of possible meanings. But the wall can be also a waterfall, a steam flow, a light lock… By saying the word "company" we immediately start imagining an office filled with people and desks while a company can be virtual, with home-based employees, etc. The term "organization" helps to be more abstract.

Specific terms always constraint our creative thinking because they are associated with specific images and patterns which increase our mental inertia. Abstraction furthermore helps to recognize links among seemingly unrelated objects and events and come up with very different ideas and concepts. Development of abstract thinking greatly boosts our creative skills.

3. Breakthrough Thinking vs. *Trade-off Thinking*

TRIZ states that emergence of contradictions is a major driving force of evolution of technological systems, and resolving contradictions by their elimination instead of trading-off helps achieve a major qualitative jump in evolution of a system. Contradictions arise when two incompatible demands are put on the same system: for instance, a travel bag must be big to accommodate all needed luggage and at the same time it has to be small to be easily moved by a traveler. It is clear that the same bag can not be big and small at the same time. A breakthrough solution will be a new service which makes the bag travel independently of a traveler: for instance, picked up from his house and delivered to his hotel in a destination point. In this case the bag can be very big, but the traveler would experience much greater deal of comfort during his trip – and thus the contradiction is resolved.

The idea of resolving contradictions to achieve breakthrough solutions was not introduced by TRIZ: it originated in the 18-19th centuries within a branch of philosophy known as dialectics by German philosophers Immanuel Kant and Georg Hegel. TRIZ managed to turn theoretical aspects of dialectics to an applied science.

For instance, a speed of a chariot will be always limited by speed of a horse, no matter how much effort we put to redesigning a chariot, or how greatly we feed horses, or how many horses we have. To find a breakthrough solution - to reach a noticeably higher speed, we need to detach from the existing concepts and think of replacing a horse with something that makes the chariot move much faster, for instance by a steam engine. But it is not always necessary to introduce radical changes:

[1] For those who are not familiar with TRIZ, I would like to recommend to start with a book by Genrich Altshuller "The Innovation Algorithm", Technical Innovation Center; 312 pages, 1999 (ISBN:0964074044), or visit www.xtriz.com for overview papers available in section "Publications".

sometimes even very "heavy" contradictions can be resolved by minimal changes in an existing system.

Apparently this is valid for many other types of man-made systems. For instance, during evolution, business, social, and political systems experience numerous contradictions as well. However when we face contradictions, our mind tends to soften conflicting demands and search for a compromise instead of targeting at breakthrough solutions that would completely eliminate contradictions and help us to come up with disruptive innovations. Thus contradictions remain unsolved - but unsolved contradictions tend to deepen over the time. Early recognition of contradictions and resolving them is one of the most important features of "power" thinking.

4. Intensification Thinking vs. *Sheltered Thinking*

We are often afraid to think outside of existing concepts and ideas. But all breakthroughs happen only when we overcome barriers set up by our mental inertia. To break these barriers, it helps to intensify given tasks, conditions, or requirements. Often we need to intensify them to such a degree that they start seeming to be "impossible".

For instance, we want to develop a new concept of a mobile phone. How small the phone should be? We can start thinking about usual dimensions of the mobile phone – for instance, its length is around 10 cm. So shall it become 6 cm? Wrong! Imagine that the phone's length should be 1 cm, or, better, 1 mm, or even a size of a biological cell. It is clear that the entire concept of a mobile phone should then become totally different. Or we want to have a screen of a mobile phone which completely fills our field of sight. It is also clear that we should think about totally different idea of the screen: probably, a projected screen, or a screen mounted in glasses, etc. By pushing existing limits far beyond we increase our chances to come up with radically new solutions.

5. Non-linear Thinking vs. *Linear Thinking*

It is known that about 80-90% of long-term forecasts made by even very renowned futurists appear to be wrong. A common mistake which is often made is focusing on extrapolating existing trends without recognition of radical changes or new factors which will become important tomorrow and which are not visible or not possible to predict today. The same happens with problem solving: while staying within a frame of known concepts and relationships it is not possible to recognize non-linear connections. Non-linear thinking also helps to bring together things that are not related today but can be linked in the future and produce a great impact on technology and society, such as was, for instance, development of a personal computer.

Non-linear thinking is not easy, since to understand the factors leading to non-linearity in evolution of a certain system, we should also recognize how the system, as well as its supersystem are going to evolve by taking into account how today's contradictions will be resolved tomorrow. Nevertheless, TRIZ studies discovered that different man-made systems in different domains tend to evolve according to similar patterns. This knowledge is extremely valuable to understand how non-linearity of systems evolution works.

6. Diversity Thinking vs. *Specialization Thinking*

Breakthrough innovations are almost always based on the "outside" knowledge. Thus, it was not surprising that I noticed that one common thing among great inventors and thinkers I was lucky to meet has been their "hunger for knowledge". And what is important, all these people did not limit themselves to a single specific area of interest: as a rule, they consumed a lot of information from totally different areas.

A library of Voltaire who lived in the 18th century counted 6.814 books, more than 2.000 of which had his handwritten remarks. A library of Thomas Edison consisted of 10.000 books. A friend of mine, who invented a disruptive technology for chemical industry, has also a library of 10.000 of scientific and technical books, and he read most of them.

Diversity helps to both see solutions in other areas and develop unique experience which helps to recognize patterns between different knowledge areas.

7. Structured Thinking vs. *Random Thinking*

We often think that to solve a "big" problem in a creative way we must "unlearn and unstructure" as much is possible. True, because it helps us to fight our mental inertia. But as noted by G. Altshuller, the originator of TRIZ, both unlearning and unstructuring produce good results rather well when we solve problems of the low degree of difficulty and which do not require numerous trials to find a solution. Once in a lifetime we can be lucky. But when we continuously facing problems of the high degree of complexity, we must structure the problem solving process. We must have a roadmap how to navigate from a problem to its solution, reuse previous experience, and patterns of strong solutions.

Does introducing a process kill creativity? Not at all. In ancient Rome, the mathematical operation of division was considered to be an art and was based on heuristic rules. Today this operation is fully formalized and automated and nobody seem to suffer from that. Bringing structure to support creative processes does not mean replacing creativity with formal procedures: creative imagination remains of great importance to find a final solution. But we can drastically save time and efforts by structuring the process and thus avoiding unnecessary errors which often cost billions of Euros and dozens of years. Most important is that a structured and well-defined process is repetitive.

8. Ideality Thinking vs. *Consumption Thinking*

Since our childhood we learn that if we want to get something, we need to pay for it. If we want to have a car, we should pay a certain money equivalent for it. If we want to launch a new enterprise, we need to invest, find new people, license needed technologies, buy office furniture, etc. If we want to build a house, we need bricks, glass, wood, etc. However these "payments" can be totally different to get the same result and it is something that we do not learn neither at schools nor universities.

Once I was involved to helping a customer who had a problem with a robot which was not properly designed to perform a required job, and as a result there was persistent loss of a product. The customer contacted the robot's manufacturer who proposed to redesign and upgrade the robot within several months by adding new electronics and precision mechanics, but such solution would cost my customer around Euro 500k. A bit too expensive, but there seemed to be little choice. However by formulating an "Ideal Final Result" concept we were able to solve the problem within one hour and our solution was implemented next day: we only used resources which were available directly in the customer's manufacturing process. Result: no product loss any longer.

Ideality is an extremely powerful concept which forces us to recognize already available resources to achieve what we want. A few years ago, if we wanted to have a video streamed from our company website, we would have to pay a large amount for an expensive broadband internet channel. Today we just upload our video to YouTube, or Vimeo, link to it, and pay nothing at all. Such resources are everywhere – and smart thinkers might achieve extraordinary results by timely recognizing and using these resources, or even by creating them to be used by others.

9. "Ultimate Goal" Thinking vs. *Shallow Thinking*

Goals are everything. Goals predetermine our results, our intentions, and our strategies. If we set up a wrong goal, we are doomed to fail; if we set up a weak goal, we will get weak results. I remember that several years ago I read a cover article in Time magazine, where the author was exploring a progress in cancer research. His conclusion was that most of research in the US was focusing on decreasing tumor sizes rather than on completely eradicating the tumors… But does reducing the tumors mean their elimination? Not necessary at all. In TRIZ, G. Altshuller introduced a concept of an "Ultimate Goal" (also known as "Worthy Goal"): let us set up goals which might not seem to be achievable today or in the nearest future: for instance to reach the stars, to completely eliminate hunger, eradicate poverty, find a cure for cancer, and alike. Probably, we will not achieve them even during our lifetimes, but the progress made would be considerably greater than defining weak goals in the very beginning.

10. Evolutionary Thinking vs. *Random Thinking*

Before TRIZ, the vast majority of innovations were made by trials and errors. However TRIZ studies uncovered laws and trends of man-made systems evolution and knowledge of these trends becomes essential to define what to create next without blind guesses. For instance, we know that a specific system in the beginning of its evolution might tend to increase the degree of dynamics by increasing dimensions, breaking to many parts, and introducing flexible links between the parts; but when the system moves over a certain point of its evolution, a number of parts, dimensions, and the overall degree of the system's dynamics tends to decrease.

For instance, consider a history of evolution of large-capacity computer memory storage: the first electromagnetic devices for storing information included large and bulky components with moving parts (electromagnets) and occupied entire rooms. Later they were replaced with tape recorders, hard drives, and optical disks (DVDs). Today we are even getting rid of hard drives: they won't be needed since they will be completely replaced with small, energy-saving, large-capacity solid-state memory devices (similarly today's USB memory sticks) without any moving parts.

Understanding mechanisms of evolution helps to considerably shorten time for new ideas development and making right decisions.

11. Long-term Thinking vs. *Short-term Thinking*

Quick fixes or investments to the future? Ok, in many cases quick fixes are necessary and justifiable, but when our thinking is only limited to quick fixes we often lose ability to see the forest for the trees. One day it might become clear that quick fixes do not work any longer but we do have neither enough time nor physical resources to avoid a forthcoming disaster. Thus quick fixes might be ok only if they are balanced by proper investments to long-term goals.

12. Out of the Box Thinking vs. *In the Box Thinking*

This is where a role of creative imagination becomes crucial. In his book "*The Psychology of Creativity*" published in 1896, French psychologist Théodule Ribot revealed that we reach a peak of our creative imagination in the age of 12-14, and then our creative imagination skills gradually degrade. It can be easily explained: when we are young, we learn from fairy tales, fantasy stories, cartoons with all kinds of non-existing creatures; but what is most important is that we play games in which we invent new fantastic characters, explore space, create new worlds, and thus we boost and develop our creative imagination skills because in these games, no one demands us to stay within the borders of "reason". Thus we push borders beyond known limits and relax our mental constraints.

When we grow older, we get drawn in the world of reason and rational thinking; and we even might be punished for "crazy" thinking. But there is no other way: moving "out of the box" demands crushing our mental barriers. Luckily, creative imagination is not magic; everyone possesses it and can further develop it.

13. Analytical Thinking vs. *"Jump-to-Solution" Thinking*

We all know very well that solving a complex problem should always involve a stage at which we should analyze the problem roots and causes, understand relationships between the problem and its environment, and so forth. However often in practice we either tend to immediately jump to solutions bypassing this stage completely or try to do it fast without paying enough attention. Any innovative problem has a number of alternative solutions, and careful analysis helps to identify where exactly to solve the problem to get most effective or ideal solution. In many cases, effective ideas can emerge directly during the analytical part because when jumping to solutions, we often ignore important information which might be crucial to solve the problem but remains hidden due to our lack of knowledge or our mental inertia. Modern TRIZ proposes a number of techniques to help with the analytical stage.

14. Problem Flow Thinking vs. *Spot Thinking*

During my problem solving sessions with customers, I often noticed then at the stage of evaluating ideas to select the most promising candidates, people tend to turn down very interesting and promising ideas. Why? Because to be implemented, these ideas would require solving other problems and we do not like this kind of difficulty. But breakthrough solutions very often require solving other problems – in other words, we need to follow the "problems flow". For instance, after Henry Ford had come up with an idea of mass production of cars, he soon realized that there were thousands of other problems to solve. And on top of that, there was a major problem: producing too many cars would be useless without an extensive network of roads. So the roads have to be built. What would happen if he rejected the idea of making a car a mass product? Two variants: either we would not have cars as a mass transportation means today, or someone else would have done it later anyway. This is, of course, an extreme case: building roads was expensive. Still, very often solving sub-problems might be easier than solving a core problem. Thus we should not ignore problem flows but explore them instead and only then make final decisions.

15. Function-Oriented Thinking vs. *Object-Oriented Thinking*

We all used to think in terms of objects, first of all. It is our dominant perception of the world: when we are born we see objects, and we do not see relationships between them. Thinking about relationships comes next. This type of perception continues being dominant during our life. However objects do not exist for themselves, they are incorporated to a system in which each of the objects deliver its own function to meet a certain goal needed for a higher system. In turn, each object consists of other objects, which interact with each other, and each of these subsystem has its own goal and to reach the goal, the subsystem delivers its own function.

Therefore, to better understand this world and its complex behaviour we must never ignore this level of functions which create all the interactions and bring meaning to the objects. Think about a coffee maker. In most cases, are we interested in the coffee maker as a device only? No. In fact, we are not interested in the coffee maker at all, since we are interested in its function – producing tasty and aromatic coffee. Do we need an iron? No, we need to have nicely looking and pleasantly fitting clothes. But neither coffee nor ironed clothes exist by themselves, we must prepare them. But functions matter more than the devices that produce them. Of course, it is not true if we look at a coffee maker or at an iron as works of art, or we are interested in them as antique historic objects having different type of valuation.

Great innovators understood that value of most things depends not on how these things look but how they perform their jobs. Of course, the look is important too, but it is secondary. Who needs a beautifully looking iron if you cannot use it? Moving thinking from the level of objects to the level of functions helps with fighting psychological inertia because the same function can be delivered in many different ways, and mental barriers created by the existing objects and their borders can be effectively broken.

A good example of functional thinking is an invention of a blade-free cooling fan by James Dyson, the inventor of the famous cyclone vacuum cleaner. In his blade-free cooling fun the function of rotating the air is delivered by the air itself – thus no blades are needed. Such cooling fun is safe and consumes less energy to work with the same performance as an ordinary cooling fan with blades.

We should keep in mind that there is always a better way to deliver a function. We just have to find it.

16. Opportunity Thinking vs. *Crisis Thinking*

In many situations, when others see problems and crises, the innovators see opportunities. It is easy to understand why the vast majority of people do not want to even notice the existing problems. Their minds are turned away from problems. Because we used to think that thinking about problems and noticing them reduces our feeling of psychological comfort. But in fact, all great innovations are solutions which solve one or another problem. It means that the best way to start innovating is to develop a skill of recognizing problems and pay attention to them rather than neglecting them.

When I perform my training sessions with groups in a typical class room, I often ask a group to look around and tell me how many problems they see. Usually they either see none at all, or say one or two problems, for example "it is too cold in the room", or something like that.

The first invention of James Dyson, mentioned above, was cyclone vacuum cleaner. It solved a problem which all of us face with traditional air cleaners: when a trash bag becomes even half full, the air has less space to pass through and the performance of the vacuum cleaner drops. Can we live with that? Well, we can. But there is always an opportunity for improvement. James Dyson solved this problem and his vacuum cleaners produced the next step along the evolution line of vacuum cleaners.

Concluding Remarks

I strongly believe that most important contribution of Genrich Altshuller and TRIZ was not only the TRIZ toolbox introduced to support creative phases of innovation, but that it was revealed how innovative thinking skills can be learned and developed. There are many techniques, both in classical and modern TRIZ which can be used to develop and support "Power Thinking Skills". They are not a mystery any longer and today we know how we can develop and master these skills.

About the author: Valeri Souchkov, TRIZ and Systematic Innovation expert certified by the founder of TRIZ Genrich Altshuller. He has been TRIZ consultant and trainer since 1988. He was among the first who pioneered promotion of TRIZ in USA and Europe, and he originated the European TRIZ Association. He trained more than 5.000 professionals in TRIZ in 40 countries and assisted in over 100 innovative projects. His training courses are licensed and taught worldwide. Currently he heads ICG Training & Consulting in Enschede, The Netherlands and

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