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TRIZ as an amplifier for corporate creativity and corporate innovation ability

"Barbara Gronauer^a, Horst Naehler^b" *

^aStrategieInnovation, Rhoenmalerring 30, 36088 Huenfeld, Germany

^bc4pi - Center for Product-Innovation, Rhoenmalerring 30, 36088 Huenfeld, Germany

* Corresponding author. Tel.: +49 66 52 99 28 280; fax: +49 6652 99 28 279. E-mail address: bg@strategieinnovation.de

Abstract

Staff members with high engagement and highly developed creativity and innovation ability help companies establish an advantageous market position by creating innovative products and services. This process can be positively influenced by applying the methods and tools of the innovation methodology TRIZ. TRIZ is helpful when using strategies in order to forecast and plan the operative phases of a product as well as when realizing the operative phases of the product. This presentation will show the advantages of establishing conditions by implementing the system-based innovation methodology TRIZ in order to motivate staff members to develop creative and innovative products.

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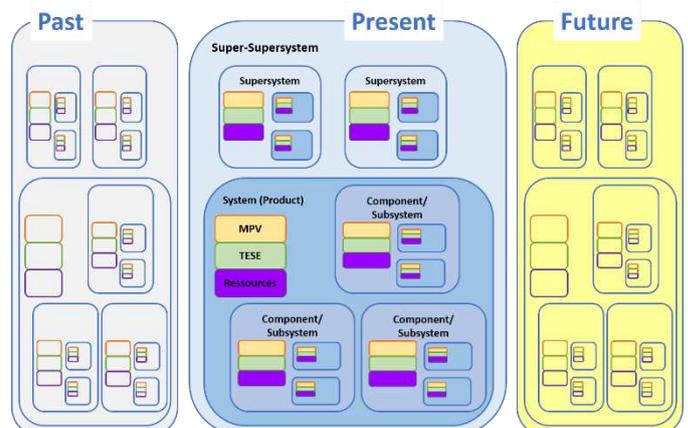
1. TRIZ Product Map for New Business and Advanced Technology Development

TRIZ provides excellent tools for designing customized problem solving and product developing processes and algorithms (KOLTZE, SOUCHKOV, 2011). These can then be used to map out the corporate product line and a strategy for reaching the business objectives. During the strategic planning process a growing functional and historical map of a product can be created.

The TRIZ Product Map accelerates the identification of inventive and innovative potential through all system hierarchies: 9-Screen Model, function analysis, S-Curve analysis and the analysis of the underlying Main Parameters of Value for the customers, serve to determine the status quo of the product portfolio. S-Curves and TESE-Assessment provide guidelines and suggestions for future development activities and planning of new product generations. So the product forecast can be completed by applying the Trends of Engineering Systems Evolution (TESE) as well as tools like

Feature Transfer, Function Oriented Search and Inventive Principles.

The next graphic shows how this TRIZ Product Map is generally built:



that directly carries out the main function: The punching rod. Basically, the cutting end of the rod has not changed much. However, the carving on the old rod is shallow while the new rod sports a deeper carving, providing a sharper edge for cutting through the paper. In TRIZ terms, this represents a higher degree of dimensionality within the trend of 1D – 2D – 3D. A lot of possible variations to develop a more efficient shape come to mind, e.g. corrugated edges, twisted blade edges or more asymmetric shapes could be assessed for their ability to cut through paper more effectively. Also, the movement of the rod currently happens only along a line (linear up and down movement). To follow the trend, a rotating movement combined with the up and down-movement could help with the cutting process, maybe combined with a complementing shape of the cutting end of the punching rod.

- b. Following the TRIZ rules of trimming means: the punch can be trimmed if the object performs the action on itself: This trimming rule sparks ideas like prepunched paper or paper with predetermined breaking points where the rings of a binder can punch through.
- c. Globalization and the radical digitization of data already led to several predictions, according to which the paper should have been extinct already years ago, rendering “hole punches” useless. However, this was not the case. Paper is still around and hole punches are still sold together with binders, folders, staplers and so on. Nevertheless, for a company which acts strategically and applies long-term thinking the combination of digitization with cloud services resulting in easily available data without paper should clearly be a concern. Paperless archiving and the acceptance of digital signatures are only a few supersystem changes that influence the use of the product “hole punch”. According to the Trend of Increased Degree of Trimming that leads to more ideal systems paints a picture of a future without paper and therefore without hole punches. Obviously, companies that produce office supplies have already branched out into the range of digital products.

Finally the case study shows three very distinct product concepts which stand for very diverse corporate product strategies. Working out the TRIZ Product Map gives companies the opportunity to understand the product life cycle in a deeper way and to recognize the corporate risks of omitted innovation activities.

3. Usage of the TRIZ Product Map

The use of the TRIZ Product Map covers several aspects for companies, which are explained below:

3.1. Understanding of the products and their dependencies on each another

As we have seen, the procedure of generating a TRIZ Product Map affects all system levels of the analysed product.

That means that several departments which work for related components or devices are affected by this process. If we start with the assumption that companies provide products which are components or devices for the other, the results of the TRIZ Product Map bring a deeper understanding of how the products and components depend on each other and how the development status and the manufacturing of them influence the overall development of the product and the success of the company.

Vice versa the TRIZ Product Map also shows which components won't be needed anymore, because they are substituted by a new assembly version or completely eliminated. In the last case, a construction and manufacturing team would be without a job and would require new work tasks, which the case study illustrates with the change from the past product version to the present.

3.2. Starting point for a strategy planning process

With this preliminary estimates based on TRIZ Trends of Engineering Systems and the overview about the uneven status of development of components and devices, the TRIZ Product Map helps to identify important milestones for the product development process.

To describe the starting position of strategic planning several TRIZ tools are combined with economically analyses:

- the validation of the varying customer needs (Main Parameter of Value) for various target groups,
- the affiliated purchase intentions,
- market chances,
- a problem analysis for uncovering bottlenecks and contradictions in future concepts .

By applying the other TRIZ tools and methods the user is able to transform the bottlenecks and contradictions into TRIZ problem models and starts the idea finding process to create potential future product scenarios.

The calculation of profitability of the different product scenarios builds the next step, which is not an original part of the TRIZ methodology but nonetheless useful and important.

After the evaluation of the strategic effects of each potential product concept, management decisions have to be found. Following the hole punch example there are three possibilities:

- a. Further development of the hole punch, even if the group of buyers will decrease
- b. Looking for a cooperation partner to develop the new paper with included, but closed holes
- c. Research of new product and market fields, because a drop in orders should be expected.

3.3. Transparency and communication to increase people motivation for the needed changes

When the phase of product realization starts, TRIZ based problem solving on each system level can be quickly initiated.

A common and transparent understanding of the whole product system is created among all people involved. Operational activities in research and development departments can be structured and planned more systemically, as interconnections between subsystems become more transparent. Necessary changes, e.g. closing of production facilities due to upcoming technological changes or a shift in the company's expertise can be planned and communicated early in advance (NAEHLER, GRONAUER, 2014).

The visualization of the product life cycles by reference to the recommendations of TRIZ S-Curve-Analysis and the explanation of the different future product concepts through the obvious changes in the supersystems and customer behaviours make the vision of the corporate change understandable and worth striving for.

This process described above requires the participation of employees from different departments, giving them a common language and system to work together. As a result, a clear picture and understanding of the past, present and future product generations is developed. Furthermore, upcoming organizational steps and changes can be deduced from this TRIZ based forecast and made transparent and understandable for the employees concerned.

The last aspect is particularly important: misunderstood changes through new products/technologies can concern the motivation and performance of the employees. This effects a decreasing of the employer's performance. The consequence is very critical - especially during the creative phase of finding new ideas and solutions for products and processes. Humans need to find a purpose in their work. Besides the necessity to earn money for life, humans wish the best possible agreement with the company's goals and their own personal goals. Resistance and low motivation of staff-members result in a lack of information about the needed changes and a lack of dialog-oriented communication to explain the "why". If the explanation of "why" is missing, employees aren't able to relate their mindset in the changing corporate strategy.

"System-laws are psychological laws which describe the most important social values and universally valid rules for human behaviour." (GRONAUER, 2011) Systemic system-laws were found through monitoring human behaviour and can be explained in comparison to animal behaviour. Human groups also follow specific patterns and rules of behavior and if these rules are violated immediate, visible or invisible reactions are caused, mostly in the form of resistance. Like laws of nature, the system-laws take effect permanently, no matter if there is any awareness for it in the system or not. Every time a system (group, person and department) violates these laws, conflicts arise. Therefore it is invaluable to be aware of those mechanisms and to consider them in projects.

The most important system law of human beings "The right to membership" is complied, if the employees get the chance to understand the conception of causal relation and find a skillful communication partner to discuss their worries about e.g. closing departments, their job security, lack of knowledge for new tasks and unknown chances for the future.

The second system law of human beings "Respect and appreciation for everybody" is about respect and appreciation for all things which were done in the past and are happening in the present. That means e.g. to give thanks to employees for their earlier performance and achievements and to explain why a change is advantageous for the corporate business. The third system-law of human beings "The balance of give-and-take" is the last very important human system-law, which should especially be consulted in relationship to corporate changes. It means that humans who have done their best to achieve previous goals need fair settlement, even if the company changes the direction of all activities. (GRONAUER, 2011)

3.4. *Individual advantages*

Another positive aspect to be mentioned is aimed at the personal advantages through TRIZ for the employee which is quite important, as well, and often underestimated. The knowledge of the TRIZ tools and experience in applying them strengthens skills highly important for the creative development process: Perception, fantasy, combination and reinterpretation skills of the employee are supported and developed, providing positive self-awareness. This results in growing self-confidence and endurance for problem solving. How does this happen?

First of all – TRIZ is based on patent analysis of several thousand patents, especially breakthrough patents, and the effectiveness has been proven thousands of times. That means that the user can trust the TRIZ methodology: By being relaxed and open-minded when following the TRIZ algorithms and by using their own creativity and ingenuity the method guides the user to the desired outcome.

After having gained these positive experiences trust in the methodology and the personal innovation ability can grow to find the right answers. The increasing certainty that good ideas will be found relaxes the user's brain, the subjective stress decreases and simultaneously the brain functionality can rise.

3.5. *Effective circumstances of the innovation process*

3.5.1. *Innovation teams*

Effective teams are recognized through the distribution of four abilities of the team members: the ability to identify the tasks and problems (analysis), to transform the problems by using the TRIZ tools and methods (transformation), to combine all ideas and thoughts into new concepts (synthesis) and to coordinate all activities along the timeline goal-focused. (RUBINA, 2014).

3.5.2. *Facilitating "creativity rooms"*

Managers are required to provide a productive, balanced working atmosphere, space, places materials and freedom to meet, to think, to experiment and to make mistakes (MEYER, 2011), to establish new knowledge as well as to pick the right members for effective development teams. A mixture of professionals, (external) experts in seldom fields and user (HAYS 2007), younger and older people

(ANTIDISKRIMINIERUNGSSTELLE DES BUNDES 2012), women and men (WEKA 2012) with various cultural backgrounds are able to cross-fertilize themselves while working towards their innovation goal. But also a clear target and a challenging time line has to be set.

3.5.3. Open mindset

Part of an effective leadership in innovations processes is to be able to detect the employer's innovation abilities. At times the knowledge and results of employees are excellent, but the mutability and fault tolerance is restricted. These staff members should get entry in a personal development program to widen their horizons and train their adaptability to new and changing conditions.

3.5.4. Using the TRIZ problem solving thinking

The founder of TRIZ Genrich Altshuller tended to share the TRIZ body of knowledge to support technical people to strengthen their way and effectiveness of inventive thinking. The usage of TRIZ speeds up the product development process by solving contradictions and problems essentially faster, but in the beginning the participants need enough time to study and practice the method.

If the employees work in effective teams and are given the resources like time and opportunities to learn and train the body of knowledge of TRIZ, they will then be able to achieve far-reaching solutions in a shorter time during the actual product realization phase.

4. Potential TRIZ Advantages for the Human Potential at a glance

Throughout the whole value creation chain, applying the TRIZ methodology can have a highly positive impact on corporate culture: The potential of creativity and innovation can explicitly be triggered. Shaping a company's future actively becomes easier.

Analysis, idea generating, conception and construction, testing, marketing and sales, all parts of the value chain could be supported through TRIZ innovation methodology.

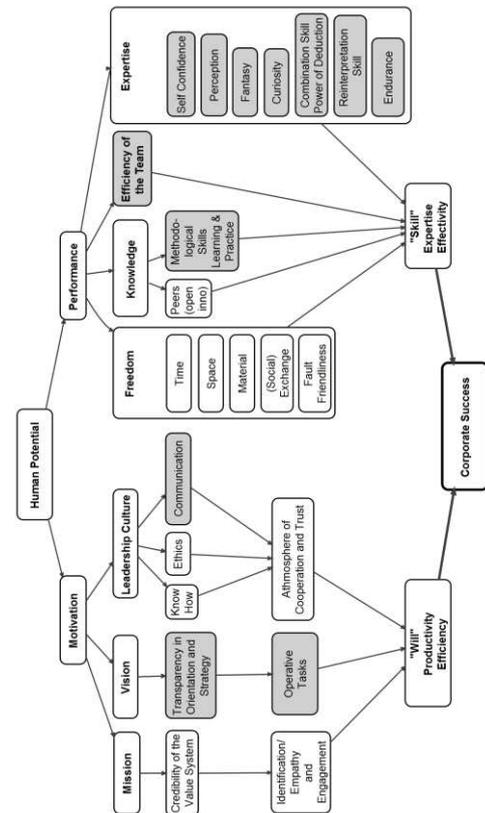


Fig. 1. Potential TRIZ Advantages (marked in grey) for the Human Potential.

5. Results and conclusions

With the use of the innovation methodology TRIZ, corporate possibilities become clearer and within reach; the multiple tools and methods assist in finding and exploiting the realization of strategic potential and operative possibilities.

Innovation Methodology TRIZ is not only a problem solving toolbox, but the usage of TRIZ supports the future development of companies. TRIZ is therefore an important building block for a strategic corporate innovation and change management.

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