

# TRIZ and innovation culture at Samsung Electro-Mechanics Company

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## Abstract

Samsung Electro-Mechanics activity is concentrated on the three main fields of technology: materials, radio frequency components and optic elements. First steps of TRIZ application were made here in 1998. At now the international high skilled interdisciplinary team is created for effective TRIZ implementation on the corporative level. The general directions of the team activities are TRIZ- consulting of projects for R&D groups, education and certification of engineers and researchers inside of manufacturing plants and development new TRIZ-methodologies. TRIZ education is provided under the guidance of experienced mentors and oriented to practical solving of real problems. Specific features of consulting projects are deep and close interrelation between TRIZ consultants and project's team members, TRIZ application in different manufacturing processes and technologies, transfer the best of created solutions for functional related engineering areas.

Such organization allows us to resolve many complicated manufacturing problems, to prepare sufficient amount of certificated in MATRIZ specialists and to provide research for TRIZ development as the science.

## 1. Forewords

According categorization [1] Samsung Electro-Mechanics is company within TRIZ proliferation at corporate level. Our basic approach to the problems of TRIZ implementation has been described by simple words as "the right projects +the right people + the right tools + the right support = the right result\$" [2]. In this paper we like to describe in detail our experience and features of realization TRIZ implementation process in company.

## 2. Samsung Electro-Mechanics core competence [3]

Samsung Electro-Mechanics (SEM) is the leading electronic parts maker in Korea and a major world player. Over 80% of our sales come from outside Korea through a growing global network of manufacturing plants, R&D centers, and sales subsidiaries and offices that covers Europe, the Americas, Japan, China, and Southeast Asia. SEM operates 7-country, 9-plant manufacturing network and 17-country, 32-offices sales network. SEM management is determined to become the world's top electronics parts maker by selectively concentrating resources on constant quality improvement and advanced technology development. SEM is focusing on the development of system modules and high-tech devices. SEM are now leveraging our technical leadership to

develop the components our customers want, lead in our core product categories, and deliver the best value in the industry. Brief description of SEM focusing areas is shown at the table below.

**Table 1. Samsung Electro-Mechanics activity [3]**

Strategic Technologies	Mainstay Product Lines
Materials	- Multi-layer circuit boards - Passive Components - Precision Motors
Radio Frequency	- Digital Tuners - Power Supplies - Mobile RF & Network Modules
Optics	- Camera Modules - LED's and LED Backlight units

## 3. Solution Creation Group as TRIZ "promotion-locomotive"

The mission of Solution Creation Group is generating creative solutions for unsolved technically difficult problems and spreading the scientific methodology including TRIZ and it contemporary modifications to all over the company. Moreover, recently the team is focusing on core future technology and it incubation. This approach makes the company having more effective innovation culture.

Major Development Areas of Solution Creation Group are:

- To solve the technical problems in the company creatively;
- To activate scientific R&D methodology by modern modification of TRIZ;
- To find core future product and business.

We achieve best compliance with formation team based on the collaboration Korean engineers and researchers with Russian TRIZ experts. Why Russian experts? It is known Russia (more exactly former Soviet Union) is motherland of TRIZ. Many Russian TRIZ specialists have tacit knowledge, deep understanding and big experience of TRIZ application. Best way of using these unique resources is co-processing work. High qualified Russian specialists support informal world wide net for informational interchange and there is very useful resource for updating TRIZ team. At the preliminary stage of the team formation process SEM prepare strong competitive examination for excluding so named “TRIZ evangelists and propagandists”. First and foremost we select our potential employees among TRIZ candidates with big scientific and engineering experience.

Usually TRIZ team work in the close cooperation with customer project team. Main functions of TRIZ team are support ideas generation stage of project and to resolve unexpected problems on other project’s stages. One of the ways to improve the procedure of project’s performance is cooperation with 6Sigma team at stage of initial analyses of real situation. TRIZ team if necessary cooperates with Computer Aided Engineering group at the analytical stage of project. We collaborate with scientific experts in Korea and external experts in technical consulting companies. TRIZ experts work with technology group at the stage of preparation for mass production and implementation of solutions.

### 3. TRIZ consulting

Technical progress is motivated in general by trends to microminiaturization, voice of customer and economical needs of company. But great number of technical problems arises to satisfy to demands of Technical progress and the most part of them can be resolved with TRIZ. Typical problems for TRIZ application are:

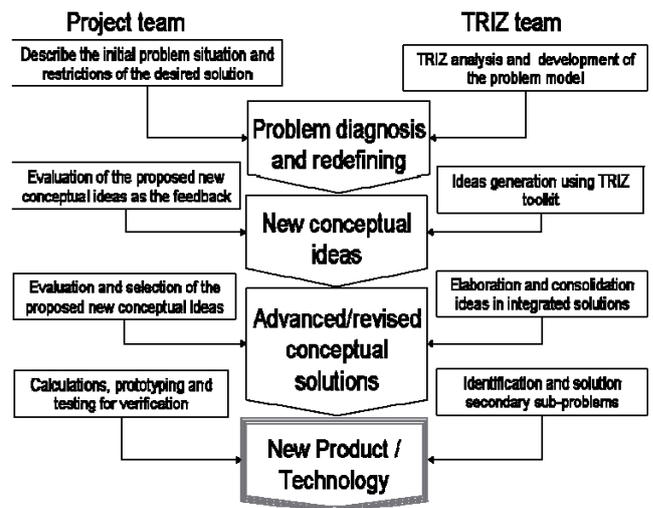
- Conceptual design of manufacturing equipment and product;
- Improvement quality of technological process e.g. deposition, soldering, plating etc;
- Increasing productivity of technological process;
- Development of new technologies or product – from the conceptual stage to verification and mass production stages;
- Patent Circumventing;
- Combined type of problems.

Depending on the object of improvement all projects are divided into 2 main categories. Comparison of these categories exhibited in the following table.

**Table 2. Comparison 2 kinds of projects**

Criteria	Main object of project	
	Mass production technology process	R&D
Possibility of changes of initial technical system	Restricted	Possible
Main criteria of concept evaluation	Simplicity, easiness for realization	More effective solution for mid and long term
Level of description of the proposed solutions	Detailed as much as possible	Brief but clear description

Specific flexible roadmap for performing of consulting projects is developed, tested and continually improved. This roadmap included typical timetable, objectives and outcomes for all typical stages of project. Organization of co-operative working process is shown at the fig. 1.



**Fig. 1. Optimal interaction between project team and TRIZ team**

Both regular open discussion and demonstration how TRIZ tools works help to overcome syndrome "not invented here". The best way to overcome the double language barrier is collective discussion with extensive and intensive using visual tools such as simplest drawing and sketches. In the cooperative work we usually apply solution-building strategy. This strategy involves creative combination of partial solutions for development the final integrated solutions.

#### 4. TRIZ education

Samsung Electro-Mechanics has well organized TRIZ training programs and stage courses including basic and advanced courses. TRIZ education program for engineers consists studying of main fundamental TRIZ tools such as 40 Principles; system of standards, ARIZ etc. During the TRIZ education participants try to solve a real technical problem of their choosing team.

TRIZ education is provided under the guidance of experienced mentors. Main part of education performed on the Korean language. Detailed Korean textbooks are prepared and systematically updated for supporting educational process. The text is supplemented by many examples from real projects and case studies. Part of lectures is provided in English or in Russian with simultaneous translation to Korean.

In addition to these basic training-programs, we have introduced an advanced course of the new development methods such as “harmful system”, functional approach etc. For the purpose of making the education useful and oriented to practical solving of real problems, we provide collegial discussion in learner’s micro-teams, individual consultation with participation of Russian TRIZ experts; personal follow-up consultations. Evaluation of outcomes of graduation work completed using opinion of project leader.

For motivation of education course’s participant we organize special TRIZ festival. For examples, at December 2007 best 10 of our learners presented their graduation work for top level technical management. According decision of technical management board 6 of them are awarded cash prizes.

#### 5. TRIZ methodology

In our practical work we used few specific methodological tools. For instance, for identification really possible causes of the failures we apply so named concept of “harmful system” [4]. “Harmful system” takes part in technological process of useful product fabrication and simultaneously produces “harmful product”. It is “invisible system” because it consists of the same elements as existing technical system and can use subsystem or super-system elements. We can say that “harmful system” does not specially create but it exist and produce “harmful product”. After determination the major components of “harmful system” we know how to destroy its activity.

One of the most important areas of our activity is TRIZ application in material science. The key publications [5, 6] were devoted to defining of material’s place in technical system. It was shown applicability of the basic concepts and tools TRIZ for development and prediction of the evolution of materials.

Functional approach is widely use for practical application for supplying performance of the technological processes. Functional approach has few major elements. At first, there is using of advanced procedure but semi-forgotten technique for exact definition of function [7]. At second, we use function – oriented search [8] for identification non-obvious “distant” prototype of solution. Thirdly, we use function synthesis for radical changes of technical system [9]. Last but not least, we use functional language for description and/or explanation of initial state-of-art situation, technical and physical contradictions, ideal final results etc. It is also very useful in overcoming of language barrier between project team and TRIZ-team.

#### 6. Next steps

Implementing TRIZ methodology with continuously modified toolset allows an organization to build a high performance innovative culture. For improving quality and effectiveness of TRIZ education we currently adapt requirements of International Association of TRIZ (MATRIZ) for certification according SEM practical needs.

For next steps of TRIZ development as science we study the technology predicting methods adapted for business-to-business applications; advanced modification of functional analyses for more compact and exact description of problem’s solving process.

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### Presenter's Profile



SeHo Cheong enters in Samsung in 1984. He is one first initiators of implementation TRIZ at Samsung. Since 2004 SeHo Cheong is vice-president of Samsung Advanced Institute of Technology. He supervise and organize interaction between 6 Sigma and TRIZ application for R&D. Since 2007 he is vice-president Corporate R&D Institute of Samsung Electro-Mechanics Company, team leader of Solution Creation Group and R&D Innovation Group. Mr. Cheong was educated at the Seong-Gyun-Gwan University in Seoul, Korea, and received his degree in Management and Industrial Psychology in 1984.