TRIZ: Theory of Inventive Problem Solving and Comparison of TRIZ with the other Problem Solving Techniques

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***Abstract*— In today's business world, it is obligatory to produce or closely follow and apply the technological and scientific developments in order to survive in a highly competitive environment by establishing productive, efficient and profitable businesses and to keep abreast of the rapid changes of the needs. In this paper, TRIZ's (Theory of Inventive Problem Solving) difference, which occurred with the possession of inventive problem solving philosophy and the provision of the possibility to use extensive knowledge base, is explained. The systematic approach of TRIZ is essentially emphasized in detail. Brief explanations of other problem solving methods are also presented in order to provide a benchmark to reveal the strong and weak characteristics of TRIZ among the other methods. The possibility of using TRIZ together with other problem solving techniques, instead of using the method as a single solution provider, is discussed in the paper.**

Index Terms—**TRIZ, Problem Solving Techniques, Management**

I. Introduction

IN today's business world, it is obligatory to produce or closely follow and apply the technological and scientific developments in order to survive in a highly competitive environment by establishing productive, efficient and profitable businesses and to keep abreast of the rapid changes of the needs. Products, services and related processes, which have to be developed and differentiated continuously, create technical and non-technical problems, which become gradually more difficult. Inventive and innovative point of view is necessary to solve these problems which cannot be handled by traditional methods. In the beginning of 1946, G. Altshuller wanted to facilitate the resolution of difficult inventive problems and to provide this facilitation to all humanity, and developed TRIZ (Theory of Inventive Problem Solving) so as to provide a tool for this necessity. In this paper, TRIZ's difference, which occurred with the possession of inventive problem solving philosophy and the provision of the possibility to use extensive knowledge base, is explained. The systematic approach of TRIZ is essentially emphasized in detail. Brief explanations of other problem solving methods are also presented in order to provide a benchmark to reveal the strong and weak characteristics of TRIZ among the other methods. The possibility of using TRIZ together with other problem solving techniques, instead of using the method as a single solution provider, is discussed in the paper. The contribution of TRIZ to future Industrial Engineering applications is also considered.

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II. Innovation and Innovativeness Concept

Innovation concept which is defined in different ways by various resources can be described as making new ideas, products, services and applications which are planned to be usable available. According to Drucker, innovation is the change of products and services in a way that can adapt to rapidly changing markets. In 1995, with respect to Money, Loan and Coordination Committee's resolution aiming to support research and development projects in Turkey, innovation is described as conversion of an idea into a marketable new or an improved product or an advanced method used for production of goods and services [1].

Innovation which is whether offered on the basis of technological possibilities or required on the basis of social needs and market requirements is a highly debated issue. Marquis indicates that "the recognition of the demand is more common factor than the recognition of technical potential in a successful innovation" [2].

Such examples that companies such as Sony, Motorola, Hewlett Packard have succeeded to elicit 30% of income thanks to their innovative strategies in a two-year period and that Sony has provided approximately 50 new products into the market every year reveals the importance of the invention of new products with smaller sources and making innovation to the existing products [3]. In this context, businesses looking for innovative solutions to problems are found to constitute the competitive section of the market.

III. Problem Solving

There are two groups of problems people face: those with generally known solutions and those with unknown solutions.

Those with known solutions can usually be solved by information found in books, technical journals, or with subject matter experts. The other type of problem requiring creativity/innovation and containing contradiction is one with no known solution and thus called “an inventive problem” [4].

3.1. Traditional Approaches to Problem Solving

Traditional Approaches to Problem Solving are as Trial and Error Method, Psychological Inertia, Brainstorming, Morphological Analysis, Synectics, Pareto Analysis, Distribution Diagrams, Control Charts, Cause-and-Effect Diagrams, Histograms, and Poka-Yoke (Mistake-proofing) Analysis

3.2. Inventive Approaches to Problem Solving

Inventive Approaches to Problem Solving are Quality Function Deployment, Taguchi methods, Six Sigma Methodology, Failure Mode and Effects Analysis (FMEA), and Design of Experiment.

IV. TRIZ: THEORY OF INVENTIVE PROBLEM SOLVING

4.1. Inventive thinking and inventive problems

An inventive problem is a problem that contains at least one contradiction. A contradiction is a situation where an attempt to improve one feature of a system leads to the degradation of another feature. The conventional way to deal with a contradiction is to look for some kind of compromise or trade-off. Problem types are shown in TABLE I [5].

TABLE I
PROBLEM TYPES [5]

New Knowledge (Scientific Problems)	New knowledge applied to known problems. Example: New plastics provide strong, lightweight products.	New knowledge applied to new problems. Example: Various uses for lasers (surgery, etc).
Existing Knowledge (Engineering Problems)	Existing knowledge applied to known problems. Example: All engineering tasks with generally known solutions.	Existing knowledge does not provide a satisfactory solution. **Inventive problem-- a new approach is needed.**
	Known Problem	New Problem

Inventive problems are often mistakenly considered to be the same as engineering, technological and design problems. However, that the inventor is looking for ways to solve problems by eliminating contradictions sets out the difference from the design process. When a creative solution or a concept found, the talents of engineers, technology manufacturers and designers need to be used [6].

The inventive thinking system is based on principles developed by the Russian scientist, Genrich Altschuler, who wanted to develop a thinking framework that would help arrive at unconventional solutions, and did not accept the concept of randomness. After studying five hundred thousand unconventional/inventive solutions and comparing them to the situation existing before the discovery of the solution, he reached the following conclusions [7]:

- Inventive solutions are based on overcoming contradictions.
- Inventive solutions are based on a finite number of methods.
- It is possible to find agreement between the different types of contradictions and arrive at the effective tactics to overcome them.

4.2. TRIZ: Theory of Inventive Problem Solving

In today's global market and ruthless competition, it has become difficult to create breakthrough products. Recently, "Innovative Engineering" era promising to improve significantly the ability to solve engineering problems that appear to be difficult and even impossible has begun. There is a revolutionary new technique which improves Engineer's knowledge, creativity and problem solving skills and enables him to attack difficult problems that require thinking .The name of this method is “TRIZ” [8]. TRIZ which is a Russian acronym consisting of initial letters of **T**eoriya **R**esheniya **I**zobreatatelskikh **Z**adatch means “Theory of Inventive Problem Solving”. The theory is created and introduced to the world in 1946 by a Russian engineer Genrich Altshuller working in the patent office of the Soviet Navy.

On the basis of the theory, the question of how to make discoveries made Altshuller inquisitive. Upon this, he worked on 200,000 patents in various fields and proved that there are 1,500 technical contradictions which can be solved by applying the basic principles [9]. Altshuller examined patents in terms of inventive problems and how they were solved and indicated that only 40000 of solutions were truly pioneering inventions, the rest represented the use of previously known idea or concept but in a novel way. Thus, the conclusion was that an idea of a design solution to new problem might be already known. TRIZ, based on a systematic view of technological world, provides techniques and tools, which help designers to create a new design idea and avoid numerous trails and errors during a problem solving process [10].

The theory is built on the following three principles [6]:

1. Ideal design is the goal.
2. Contradictions help to solve the problems.
3. Innovative process can be configured systematically.

Figure 1 illustrates the basic structure of TRIZ. TRIZ analytical tools, which do not use every piece of information about the product where the problem resides, are used for problem modeling, analysis and transformation. The way they generalize a specific situation is to represent a problem as either a contradiction, or a substance-field model, or just as a required function realization. ARIZ is such a sophisticated analytical tool that it integrates above three tools and other techniques [10].

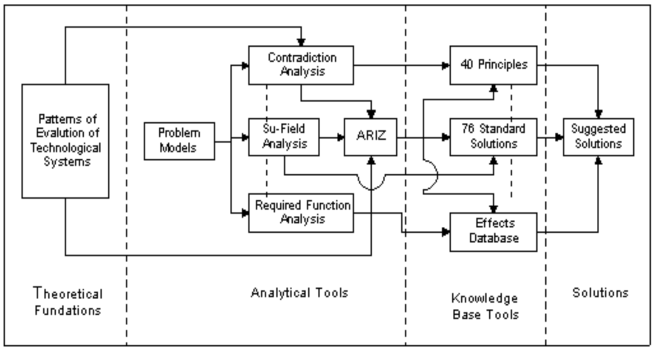

Fig 1. Structure of TRIZ Methodology [10]

As a result of work done on the different fields of engineering patents, a few important discoveries that make up the philosophy of TRIZ are as follows [11]:

- Each designer item is developed according to an order, which is common for all engineering fields and can be used to estimate development of the designed by using inventive problem solving.
- Design products are improved as a result of the destruction of several contradictions by means of the principles common to all fields of technology.
- As inventive problem is expressed as a contrast between the new requirements of the product needs of which are no longer met; inventive solution means elimination of contradiction in a state when compromise is not allowed.
- For the best possible solution, universal measure is idealism whose degree is the ratio between the beneficial effects of the product design, and expenditure of material, energy and information which is necessary to create these effects.
- Generally, in the search for a solution to the problem described as contradiction, the need for using physical knowledge which is not known by the engineer of the same field arises. To manage and direct physical effects of appropriate physical knowledge, indicators should be used. Physical phenomena are specified by the technical function lists in indicators.

Instead of walking around contradictions which is performed many times in the history of science and technology, the fundamental basis of TRIZ is to eliminate these contradictions. In TRIZ studies, by examining a large number of patents considered as records of technical innovations, typical solutions have been developed to the problems which hosted technical contradictions. Figure 2 illustrates that TRIZ produces better results on the contradiction parameters than normal design compromise does [12].

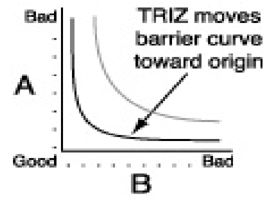

Fig 2. TRIZ's impact on contradictions [12]

TRIZ recognizes two categories of contradictions which are defined in Figure 2 [13]:

- **Technical contradictions:** Technical contradictions are the classical engineering trade-offs. The desired state can't be reached because something else in the system prevents it. In other words, when something gets better, something else gets worse. The examples below can be accepted as technical contradictions:
  - The product gets stronger , but the weight increases
  - The bandwidth for a communication system increases, but requires more power.
  - Service is customized to each customer, but the service delivery system gets complicated.
  - A car airbag needs to be opened quickly to protect the passenger but increasing the speed may lead to personal injury or even death for young children or those who improperly sit.
- **Physical contradictions:** Physical contradictions are situations in which one object has opposite requirements. That the system in problem is requested toward a direction in one aspect, while the same system is requested toward the opposite direction in the same aspect leads to physical contradiction. At this point, this situation is thought to be impossible [14]. Examples for Physical contradictions are stated below:
  - Surveillance aircraft should fly fast to get to the destination, but should fly slowly to collect data directly over the target for long time periods.
  - Software should be complex to have many features, but should be simple to be easy to use.
  - Coffee should be hot for enjoyable drinking, but cold to prevent burning the customer.
  - Training should take a long time, but not take any time.
  - A car airbag should be opened quickly and gently.
  - Chocolate-coated candy should be hot for easy filling, but should be cold to prevent melting.
  - Brake should be sudden to avoid accidents but should be gradual to ensure the control.

4.3. TRIZ's Problem-Solving Tools

4.3.1. Contradiction Analysis

Contradiction Analysis is a powerful tool of looking problem with the new perspective. In TRIZ standpoint, a challenging problem can be expressed as either a technical contradiction or a physical contradiction. A technical contradiction might be solved by using contradiction table that identifies 39 characteristics most frequently involved in design process. A physical contradiction might be solved by separation principles. Contradiction analysis is the fundamental step to apply 40 inventive principles, one of the knowledge base tools [10].

First of all, in order to express the technical problem, which aspect of the current system is intended to improve and which aspect of the system that contradicts with this improvement leads to worsening should be stated. To explain these aspects, TRIZ uses 39 standard parameters [12]. Moving objects in the system are defined as the objects which can easily change position in space, either on their own, or as a result of external forces. Vehicles and objects designed to be portable are the basic members of this class. Stationary objects in the system are defined as the objects which do not change position in space, either on their own, or as a result of external forces. The conditions under which the object is being used should be considered.

39 engineering parameters are listed below [15]:

1. Weight of moving object
2. Weight of stationary object
3. Length of moving object
4. Length of stationary object
5. Area of moving object
6. Area of stationary object
7. Volume of moving object
8. Volume of stationary object
9. Speed
10. Force (intensity)
11. Stress or pressure
12. Shape
13. Stability of the object's composition
14. Strength
15. Duration of action by a moving object
16. Duration of action by a stationary object
17. Temperature
18. Illumination intensity
19. Use of energy by moving object
20. Use of energy by stationary object
21. Power
22. Loss of Energy
23. Loss of substance
24. Loss of Information
25. Loss of Time
26. Quantity of substance/the matter
27. Reliability
28. Measurement accuracy
29. Manufacturing precision
30. External harm affects the object
31. Object-generated harmful factors
32. Ease of manufacture
33. Ease of operation
34. Ease of repair
35. Adaptability or versatility
36. Device complexity
37. Difficulty of detecting and measuring
38. Extent of automation
39. Productivity

To illustrate technical contradictions, a matrix consisting of 39 worsening and 39 improving parameters is used. Having analyzed the technological innovations registered in the patents, Altshuller and his students classifies every innovation problem in a 39x39-sized matrix. As the basis of solutions in the patterns is expressed according to 40 inventive principles, patent analysis is concluded by putting the first appropriate four principles in the cells of the matrix. This structure is named as "Contradiction Matrix". Contradiction Matrix has created the first information database of TRIZ.

Engineers eager to solve the technical problems should explain the offered problem in terms of improving parameter for worsening parameter and afterwards should use 40 most frequently used invention principles which are listed in the matrix in order to solve the problem inventively. Thus, in the process of problem-solving, engineers looking for a solution may take principles and practices as a reference.

"Contradiction Matrix" has presented a method that allows re-use of the previously realized innovations and the samples of big moves in order to solve the existing problems. However TRIZ, in order to achieve it, when identifying problems and solutions, has forced the use of the abstract framework of a fixed set of terminology by using the contradictions between 39 parameters for the problems and by using 40 parameters for the solutions. This enforcement has enabled to classify a very large number of patents and create an easily reusable knowledge. Figure 3 shows the usage of Contradiction Matrix eliminating the technical contradictions [12].

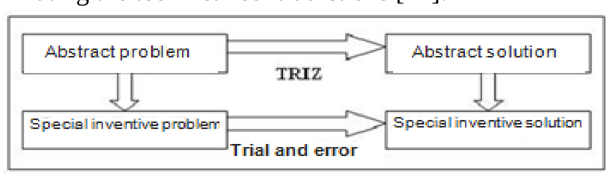

Fig 3. Contradiction Matrix eliminating the technical contradictions [12]

Being an easily-used toolkit of TRIZ, 40 inventive principals provide solutions simply and quickly [16]. These principals denote the 40 different strategies which have been derived from thousands of patent examinations and used for the solutions of the contradictions.

The 40 Inventive Principles with examples are listed and parts of a Contradiction Matrix are shown below [17]:

1. Segmentation
2. Taking out
3. Local Quality
4. Asymmetry
5. Merging

6. Universality
7. 'Nested doll'
8. Anti-weight
9. Preliminary anti-action
10. Preliminary action
11. Beforehand cushioning
12. Equipotentiality
13. 'The other way around'
14. Spheroidality
15. Dynamics
16. Partial or excessive actions
17. Another dimension
18. Mechanical vibration
19. Periodic action
20. Continuity of useful action
21. Skipping
22. 'Blessing in disguise'
23. Feedback
24. 'Intermediary'
25. Self-service
26. Copying
27. Cheap short-living
28. Mechanics substitution
29. Pneumatics and hydraulics
30. Flexible shells and thin films
31. Porous materials
32. Color changes
33. Homogeneity
34. Discarding and recovering
35. Parameter changes
36. Phase transitions
37. Thermal expansion
38. Strong oxidants
39. Inert atmosphere
40. Composite material

A	B	C	D	E	F	G	H	I	J	K	L	M
	Worsening Feature → / Improving Feature ↓	Weight of moving object	Weight of stationary object	Length of moving object	Length of stationary object	Area of moving object	Area of stationary object	Volume of moving object	Volume of stationary object	Speed	Force (Intensity)	Stress or pressure
		1	2	3	4	5	6	7	8	9	10	11
1	Weight of moving object	+		15, 8, 29,34		29, 17, 38, 34		29, 2, 40, 28		2, 8, 15, 38	8, 10, 18, 37	10, 36, 37, 40
2	Weight of stationary object		+		10, 1, 29, 35		35, 30, 13, 2		5, 35, 14, 2		8, 10, 19, 35	13, 29, 10, 18
3	Length of moving object	8, 15, 29, 34		+		15, 17, 4		7, 17, 4, 35		13, 4, 8	17, 10, 4	1, 8, 35
4	Length of stationary object		35, 28, 40, 29		+		17, 7, 10, 40		35, 8, 2,14		28, 10	1, 14, 35
5	Area of moving object	2, 17, 29, 4		14, 15, 18, 4		+		7, 14, 17, 4		29, 30, 4, 34	19, 30, 35, 2	10, 15, 36, 28
6	Area of stationary object		30, 2, 14, 18		26, 7, 9, 39		+				1, 18, 35, 36	10, 15, 36, 37
7	Volume of moving object	2, 26, 29, 40		1, 7, 4, 35		1, 7, 4, 17		+		29, 4, 38, 34	15, 35, 36, 37	6, 35, 36, 37
8	Volume of stationary object		35, 10, 19, 14	19, 14	35, 8, 2, 14				+		2, 18, 37	24, 35
9	Speed	2, 28, 13, 38		13, 14, 8		29, 30, 34		7, 29, 34		+	13, 28, 15, 19	6, 18, 38, 40

Fig 4. Part of a Contradiction Matrix [17]

4.3.2. The Algorithm for Inventive Problem Solving (ARIZ)

With ideality law helping determine the direction of research and with technical analysis of conflict demonstrating obstacle to be destroyed, it is possible to control the process of creative problem solving. However, sometimes situations in which a contradiction hiding in the problem expression, and even not revealing by itself as an isolated case can be seen. At such times, since it is not easy to go to solution from the problem statement, intelligent tactics ensuring a step by step approach to the solution need to be used [18].

Being the acronym of the “The Algorithm for Inventive Problem Solving” in Russian language, ARIZ is presented as a method for implementing these tactics. According to Glenn Mazur, ARIZ is a systematic procedure for identifying solutions without apparent contradictions [4]. Depending on the nature of the problem, the number of phases to be completed varies and from an unclear technical problem, the underlying technical problem can be revealed thanks to ARIZ. ARIZ can be used with levels two, three, and four problems with respect to their inventive levels.

ARIZ whose structure is depicted in the Figure 5 is not an equation, but rather a multi-step process asking you a series of questions that integrates different pieces of TRIZ. ARIZ is a very "solution neutral" process; it takes preconceived solutions out of the problem statement.

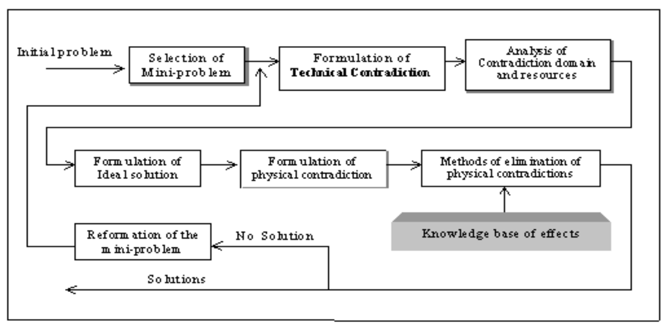

Fig 5. Structure of ARIZ [10]

ARIZ;

- is a process of problem reformulations.
- is a logical and disciplined period.
- continually reinterprets the problem.
- is the main TRIZ method for solving conflicts.

ARIZ utilizes the tools below which are within TRIZ scope in problem solving;

- Ideality for an understanding of the Ideal Solution to the problem Contradictions, by working first with the technical contradiction, then the physical contradiction,
- Resources of the system,
- Scientific effects,
- Substance-field modeling and Standard Solutions,
- the 40 Principles.

It is important to note that ARIZ is more than 50% problem reformulation. It is only through this guided reformulation that complex problems can be solved. ARIZ consists of a total of 9 basic steps that can be allocated into 3 main groups. The number of sub-steps varies from version to version of ARIZ [19].

TRIZ, has been constructed relying on a lot of sources. Among them there are sciences having a high degree of generalization such as dialectics, systems theory, cybernetics, information theory all of which have a very large area of application. Their current knowledge and new findings in the future can facilitate effectively the process of enlarging TRIZ on the path to creation of the general theory of creative problem solving.

There are two sides of human creativity: subjective (psychological) and objective. According to TRIZ, the essence of the issue is that only the person who grasps the objective laws of systems development and manages his/ her psychology along them can achieve a high efficiency in creativity. It is obvious that this management will be better if the person knows how his/her psychological factors work. So, teaching of enlarged TRIZ needs to be supplemented by more knowledge of cognitive psychology.

Patent information which on its merits is information about inventive creativity (or development of inventions) has helped research work in order to reveal the objective development laws of technological systems. Then, for the presentation of the enlarged TRIZ, in addition to the importance of using the laws of the evolution of systems for applications, illustrations taken from non-technological areas can be used.

When tackling inventive problems of the highest levels, in addition to knowledge of the technology studied on, extensive knowledge of geometry, physics and chemistry. In this context, the studies aiming to enable the inventors to have more information on these fields will gain importance in the future. In enlarging TRIZ, every enlargement in TRIZ should be verified, corrected and perfected through feedbacks established with the development information in general and patent information in particular and practices and the results of use of learners during and after the teaching process.

It's important for the enlargement of TRIZ to be reached not only higher levels of education but also people with low level of education. During its evolution and development period, TRIZ can be enlarged toward specialization on stages of a process of conducting creativity and innovation, and on theoretical and applied issues.

V. Comparison of the Traditional and Inventive Problem Solving Approaches with TRIZ

The most important shortcoming of traditional methods is the loss of their usability when complexity of the problem increases. In Trial-error method, as the difficulty of the problem increases so does the number of attempts and thus time consumption and cost augments. Altshuller's study focuses on facilitation of the solution of hard creative problems and transfer of it to other people, this effort has led to the creation of TRIZ [6].

As TRIZ is offering a smart and cost-effective way to finding solutions to problems more quickly compared to the traditional problem-solving techniques, it helps engineers and scientists. TRIZ enables researchers to understand the actual functionality of problem solving, which results in designinig many traditional patents. TRIZ not only brings conceptual solutions to the problems but also becomes remedy to the problems of implementing these solutions.

From the point of comparative perspective it is also possible to assess TRIZ with other inventive methods. Evaluated together with other creative problem solving techniques such as Quality Function Deployment Design of Experiment, TRIZ is seen to have an important feature to fill the gaps that aren't addressed by these techniques. For the brainstorming groups, while providing an incentive to problem-solving process, it also focuses on helping their creativity. Together with the use of S-curve analysis and technological forecasting, TRIZ helps the ones who prepare product development strategies to make prediction about direction of the evolution of technology and product life cycle related to it [18]. Figure 6 includes a diagram illustrating the comparison of various inventive problem solving techniques with TRIZ. According to Figure 6, while TRIZ together with brainstorming appears to be the most successful method in production of new ideas, it stays away from industrialization, stands out as the most successful method with regard to efficiency.

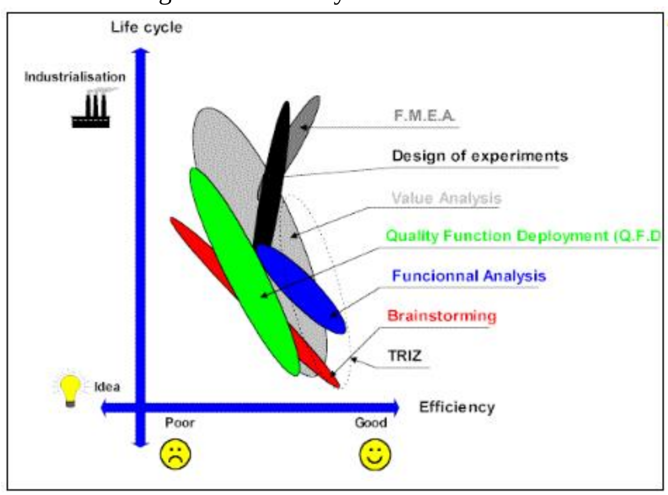

Fig 6. Comparison of various inventive problem solving techniques with TRIZ

5.1. Cooperation of the other inventive problem solving methods with TRIZ

5.1.1. TRIZ and Six Sigma

Six Sigma is a very structured quality improvement methodology and TRIZ is an inventive one; by applying both of them together, inventive problem solving tools can be used for quality improvement and the highest degree of quality can be achieved with inventive quality improvement methodology. [21]. As it is known, improving the quality of the product or service by reducing the number of errors made in production or service in an effort to increase customer satisfaction and profitability takes part in the development of the Six Sigma method.

At this point, the customer's demands, especially in a highly competitive environment, are very important variable which has become a target to be defined, predicted and, if possible, affected. However, to do this, using the trial and error method is both time-consuming and risky. According to Averboukh, instead of using this, employing TRIZ's inventive approach will make a significant contribution to the Six Sigma solutions [22].

Using TRIZ's advanced methods and tools for the points where Six Sigma is insufficient in an effort to improve this method provides customer satisfaction and profitability growth by eliminating decision-making errors in definition, producing low-cost solutions in design, triggering the loss of time in analysis and measurement to reduce errors

5.2. TRIZ, Quality Function Deployment (QFD) and Taguchi Method

Quality Function Deployment (QFD) concentrates on "what the customer wants?" Thus, it really defines the "Functional Requirements" without actually concerning directly with the question: "how these functions are met and which technology is used?" The "house of quality" matrix qualitatively shows the gaps between organization's capabilities and customer requirements. QFD's "house of quality" can be used to point out conflicts and the parameters that conflict. This can be directly used by TRIZ's Contradiction Matrix to eliminate the conflict.

A Taguchi method reveals the need to determine the optimal parameters of processes and products for the best result. From time to time that the two process variables may create technical contradiction on the two or more features or a single variable producing good and bad features at different levels lead to physical conflict may be the case. The Taguchi method thus points out clearly the technical and physical contradictions and thus helps TRIZ in the sense of identification of the problem becomes easy TRIZ tools can then be applied to resolve the contradictions. Exactly in the opposite way, the innovative solution concepts of TRIZ can be verified, evaluated, implemented by planning an experiment where parameter settings can be optimized and best process can be selected [5]. Benefits using of QFD and TRIZ used together are shown in TABLE II [10].

5.3. TRIZ and Quality

Maintaining Quality management which leads to the emergence of contradictions in the life cycle of product or service necessitates the development of control systems in a continuous and creative manner. The growth of creativity helps the development of the concepts of product/process development and quality improvement. As analyses which are conducted for the quality is providing information about the customer requests and what the process with how many employees should be conducted, creativity is necessary to find ways of new products, services, processes and systems. [17].

In addition, when effects of ideality-oriented the point of view of a customer who is waiting for the products and services to be at the lowest cost with the highest functions, TRIZ's direct relation with the quality highlighting the creativity and creative problem solving occurs. The creativity is not enough on its own in order to achieve high quality. Customer-focused strategies, combined with creativity, give rise to high-quality products and services [88].

TABLE II
BENEFITS OF USING QFD AND TRIZ TOGETHER [10]

Development Phase	**QFD**	**Benefits of Using QFD and TRIZ Together**
Market Research	7 Product Planning Tools	Use Directed Product Evolution (DPE) with concept methods to show customers what new products will be like.
R&D	Technology Deployment	To solve engineering bottlenecks and contradictions
	Quality Deployment	To eliminate contradictions discovered by the roof of the House of Quality.
Design	Function Deployment	Use Strategic Unit-Field Analysis and DPE to identify new functions to excite customers.
	Reliability Deployment	Use Anticipatory Failure Determination to identify and prevent catastrophic failure modes in new products
	Concept Deployment	To develop new concepts by DPE patterns
	Cost Deployment	Use TRIZ to lower costs without resorting to tradeoffs.
Manufacturing	Equipment Deployment	Remove design constraints due to limitations of equipment and manufacturability.
	Process Deployment	Remove design constraints due to limitations of processes and people.
After Service	Service Deployment	Help in design for serviceability. Remove service bottlenecks

VI. CONCLUSION

TRIZ has defined evolution trends which are not bound to fields by exploring the systematic nature of technological evolution. A new classification has been created for design solutions. Contradictions are mentioned at the basis of the problems and inventions have been realized by destroying these contradictions. Some basic principles have been proposed for the elimination of contradictions and provided systematic access to these principles. Common patterns can be used in order to convert physical structures of the products by establishing models which is formed by interaction of material, space of systems or designs. TRIZ has also revealed some operations to overcome the psychological inertia of the designer or inventor. Several case studies have revealed that TRIZ has played a successful and accelerating role by enabling the invention of new conceptual solutions.

The path of rapid access to the necessary information which is the most important element of a successful creative design process is offered to with the help of TRIZ's extensive database. TRIZ provides in the form of systematic rules and guidelines that creative people can examine the past experience of creativity by taking advantage of knowledge of all the world's patents. Pointing to natural events and the physical effects, TRIZ organizes research which could fulfill the function that is thought to be necessary for a system using a physical principle.

TRIZ not only presents an effective method in an effort for solving the problem for the users by defining an independent progress in the field of evolution patterns of the available systems, but also help making the prediction about future changes which can be made on the product or the features a new product needs to have. The purpose of TRIZ is not to supersede human creativity, but to enable the user to access necessary the information quickly by orginizing creative thinking process. To solve the recently-faced inventive problems users, without requirements of creative abilities they are adopted before, can perform the process by using TRIZ tools.

Recognized relatively late by the world owing to its date of emergence, but showing rapid development and deployment, theory of inventive problem-solving, TRIZ is a comprehensive, systematic and scientific problem solving and creativity method the frequent use of which is highly probable in the future. Furthermore, the businesses using different types of methods, with the development of theoretical infrastructure, seem likely to use their current practice method in a unified way with TRIZ. Businesses primarily, if needed, getting help from the current TRIZ consulting companies in an effort to train the expert staff who will use this method. TRIZ staff's examining TRIZ applications and getting used to the methods by making trials with TRIZ-based software and afterwards working to spread the method to the wider base are the levels which need to be taken into account within the scope of the transition to TRIZ. Increment of the number and the capabilities of softwares, making the educational process more clear and concise and in the event of enabling the provision of the introduction of TRIZ more common for the businesses who need to make improvements; this able method wil be able to serve to humanity in a broader way.

ACKNOWLEDGMENT

The study is selected from International Symposium on Engineering Artificial Intelligent and Applications ISEAIA 2013 (Girne American University).

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