

Creativity Engineering and Innovation and Its Role in Technology Development

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Abstract

Development as one of the most important goals of human societies requires a tool such as technology to influence its own structures for growth. The rate of technology development with its growing trend has been able to bring about major changes in human inputs and outputs. The advancement and prosperity of societies, economic prosperity, and the expansion of industries, the creation of wealth and the creation of competitive advantage can be seen from the results of the application of technology and its development. The development of technology, which is a dynamic structure, has led factors such as creativity and innovation engineering to provide a logical and systematic approach to appropriate solutions to technological problems. The purpose of the paper is to examine and analyze the effects of creativity and innovation on technology development. Also the research method was a library; all information was collected and analyzed through databases.

Keywords: Creativity, Innovation, Technology development.

1. Introduction

Achieving prosperity as the main pillar of development requires its communities and structures to create the right framework for improving quality of life and its indicators so that communities can take the multi-dimensional process of development with the pivotal goal of developing appropriate human inputs (Zoltin & et al, 2011). The development process to meet the growing needs of societies and create appropriate conditions based on the value system requires the capacity and capacity of the main institutions to influence all aspects of development, such as social development, industrial development and human resource development (Toudar, 1985). According to experts, technology and its development can be considered the key to development. Of course, it should be noted that the development of conceptual technology goes beyond the creation of technology which, with its sensitivity to the competitive performance of firms, has enabled the minds of societies to focus on this, what are the barriers to technology development? Are only technical and managerial factors involved in the lack of technological development, or should human technology be considered? Technology is undeniably known as the core of development, which uses its own components, including technology, human resources, and hardware and software organizations. Converts data to marketable products (Nasirzadeh, 2005). The importance of technology is rooted in its competitive nature (Souchkov & et al, 2005). Therefore, attention to the management and development of technology for large-scale planning

and policy making is one of the requirements of each system. The key to solving these problems and problems is in revealing, formulating contradictions, and utilizing creative engineering techniques and innovative theory of problem solving and deep rooted in technology development issues that shape the main goal of this paper.

2. Methodology

The information in this research is gathered in the form of libraries and documents. The information needed for the research is gathered by checking the books, valid papers and etc. However, this research has been faced with a lack of scientific and Professional knowledge and there has been no systematic and substantiated research on the topic in question. Most of the research was superficial and limited to definitions, after collecting information with a descriptive-analytical approach paid it.

3. Findings

3.1 Management and development of technology

Technology management as an interdisciplinary specialist has been able to integrate basic science, engineering, knowledge and management practices, and emphasize technology as a source of wealth creation (Tarogh,2010). According to Liao(2005), technology management is the process of planning, guidance, control and coordination of technological capabilities in order to achieve the strategic and operational goals of the organization (Liao,2005). Which continuously engages management and staff with the goal of increasing productivity, improving the quality of personal and professional life in the technological innovation process (Somwan,1987). Technology management, with the creation and diffusion of technology into the endeavors of seamlessly manpower, highlights its impact on the integration, evaluation, marketing and commercialization of technology in industrial activities (Tarogh,2010). In order to provide technology management in principle, evaluation indicators such as the prediction of the potential of new technologies, the implementation of long-term plans for the development of technological facilities and the continuous examination of future technologies (Morita & et al,2001) to manage the technology in the process of distinguishing products and services, reducing operating costs, creating new business opportunities, play a role as a facilitator and supporter of strategic changes in the best way (Floid, 2009). Technology management has national, organizational and individual dimensions. In the national dimension (macro level), it is primarily focused on the role of public policies in advancing science and technology, in the organizational dimension (micro level), it helps to establish and maintain the competitive ability of organizations, and in the individual dimension, the financial power of the person is increased (Tarogh, 2010). Therefore, attention to different aspects of technology management dimensions should be highlighted in the management plans. The lack of integration of efficient and effective technologies, the lack of education for the use of technology and the harmful

environmental effects of technology always threaten the management of technology (Mann, 2014) and its various dimensions, which can be transformed into opportunity by identifying the relevant domains, and more they enjoyed their existence (Faghahi, 2011). Today, the development process of societies requires the adoption of a concept of technology that, at the same time as comprehensiveness, puts its software aspects in a practical, priority and important place. Changing the concept of technology from the mechanical and hardware aspects to the intellectual and software aspects is one of the signs of stepping in the path of development (Nasirzadeh, 2005). To institutionalize this, it is enough to educate everyone about what has so far been considered as unreasonable, and rationally and rationally. Development of product technology Improves and strengthens resources to create and manage change (Platt & et al, 1999). Which continuously paves the way for countries and industries to develop competitive assets and improve competitive advantage (Wang, 2009). Technology development is the focus of all the efforts and activities that are being undertaken to promote the level of technology. These efforts may lead to the creation of new technology or to improve existing technology. What is essential for technology development is a strategy that combines technology transfer and its endogenous development, because the transfer and development of technology can be complementary to each other (Abbas Puor, 2007). Technology development is a sign of human creativity (Tarogh, 2010), the four main phases of which are as follows:

1. Defining Technology Strategies: What technology does the technology determine what tasks should be done to improve new technologies.

2. Conceptualization: Whatever should be considered at this stage is not to distract from the path to improvement. Finally, in the stage of development and selection, the best concepts for development are selected.

3. Optimization: To achieve the flexibility and maturity of new technologies, optimization is essential.

4. Selection and Transmission: By examining the various aspects of successful technology, four criteria for excellence, stability, maturity and flexibility have been introduced, according to which, selected technologies are transferred to other development programs (Clausing, 2001). The ultimate goal is the development of technology, the optimal development of resources, and the improvement of their use processes, which ultimately leads to increased productivity of enterprises and more profitability of firms (Christiansen, 2000). Hence, the need for proper planning, dynamic organization, supply and training of expert manpower and effective control of activities is still felt. Technology in the path of development has always faced barriers that their growing trend brings the technology gap up-to-date (Shafiei, 2003). Considering the four components of technology based on a systematic vision and knowing the

interaction between components and their synergistic effect in general, primary and primary spillovers overcome these obstacles and pave the way for the full development of technology (Nasirzadeh, 2005). In this way, it is essential to focus on the factors affecting the development of technology, including creativity and innovation as the facilitator, as well as the cooperation and interaction of educational and research, industrial and judicial systems with the technological policies of technology development (Salami, 2004).

4. Creativity Engineering

The process of developing knowledge, technology, and the vast flow of information, systems and members requires them to understand the skills to deal with problems and solve problems in order to survive and continuously progress (Salamatov, 2012), so the existence of an active spirit for this intellectual body is essential to With the continuity of time, initiative and adaptability can achieve their goals (Alvani, 2009). Researchers and psychologists such as Guilford (1959), for exiting intellectual stomachs, propose skills such as creative thinking, creativity and innovation, and extraordinary techniques to make it possible to identify changes and changes in the environment to face barriers and problems and with an innovative approach to solving problems. Therefore, in a comprehensive definition, creativity is described as creativity in the sense of creating a new and unique thing that is capable of solving a problem, question or scientific, industrial or social need in a way that is appropriate and useful (Pirkhani, 2011). In fact, the principles of creativity and innovation entail a new or bad response or concept, but it should be noted that this novelty should be consistent with the logical and real principles. In order to solve this problem, Mr. Altshoouer introduced the systematic approach to creativity and innovation engineering over the years, which we will discuss in more detail.

4.1 Relationship between technology development and creativity engineering

Given the variety of existing methods for solving technological problems and problems, and by changing the methods and approaches of problem solving from the reaction-to-problem approach to the problem-avoidance approach, creativity engineering has been able, as one of the best tools, to be able to solve and the impact on solving a variety of technological issues, etc. With its systematic approach, creativity engineering has undergone four major phases of technology development, in particular, the technology strategy, with profound changes (Clausing, 2001). The urgent need for creativity to guide the problem-solving process, the search for problems in the unknown, and the ability to utilize creative methods and patterns have led to issues such as creativity engineering, innovative theory of problem solving and creative thinking with respect to their abilities, such as adopting a new attitude based on forms Evolution, the ability to analyze quickly and effectively more than ever before. Technological changes lead to improved technology levels. Therefore, the technology

development process refers to all the efforts and activities undertaken to promote the level of technology in a country, government or organization. These changes are based on innovative and innovative approaches that lead to the creation of new technology, the improvement and development of technology (Salimi, 2009).

4.2 Creative Engineering and Innovative Theory of Problem Solving

The collaboration of Ghenarich Altshoerer with inventors for patenting, analyzing and reviewing thousands of registered innovations led to a systematic problem-solving methodology. This methodological rationalism was later used as a tool for solving technological problems, complex and simple issues (Massourian, 2008). The process step-by-step, the ideal solution, the repeatability, and the structure for knowledge of the invention are the first principles that Altshoerer discovered in their studies, and by further studying the role of the technical contradictions in solving the problem, the contradiction matrix Invented. TRIZ ¹as a science that emerged from the late half of the 19th century, has undergone various stages of evolution, the following table illustrates the evolution of this knowledge.

Year	The history of creativity and innovation engineering
1982-1989	Expansion of the application of TRIZ in different domains to the field of art and mathematics Classification of the Five Standard System of Innovation with 76 Principles Getting Started by the Russian Trench Association
1998-1990	Provides a US-based TRIZ Software Package Named the Russian Trench Association, as the International Trident Association
1999-2011	Development of the application of TRIZ in different organizations Provide new tools, including the origin of paradox analysis Integrating management and quality engineering models such as improving quality performance

Table 1. The history of creativity and innovation engineering

TRIZ is in the range of a spectrum that is, at the beginning, a kind of creative world-view or a comprehensive approach to science and technology, and at the end of it there are innovative means of solving the problem and techniques of creativity and innovation. In fact, with a comprehensive definition, engineering creativity can be defined as humanistic knowledge based on systematic methodology for solving the problem indiscriminately, TRIZ is an algorithmic approach to inventive solution of technical issues. TRIZ research begins with this assumption, the universal principles of invention are the basis for creative innovation using advanced technology, that is, if these principles are defined, they can help people think in creating innovative processes that are more predictive (Christiansen, 2000).

¹ Russia = Teoriya Resheniya Izobrototelskikh Zadatch & English = Theory of Inventive Problem Solving

In the problem-solving process, the best solution is to choose the most appropriate principles by focusing on details. The use of TRIZ generates concepts for reducing negative impacts and improvements in design, especially the design of a strategy in the management and development of technology. Practice areas of practice in practice can generally be classified into six areas:

1. Improvement and development of technology.
2. Register innovations and develop new innovations.
3. Develop new products.
4. Development of existing products.
5. Projections for short and long periods.
6. Research and scientific engineering.

In actual performance, technology improvements and the development of existing products are tasks that are more than other tasks, and following the technology's performance, organizations are trying to use the best of the new technology parameters with the least cost to develop existing technology. (Pilginton, 2006).

In recent years, with successive success stories, a new style of problem solving theory, a process-centered approach, has come into being. The Advanced TRIZ uses its six main steps to analyze problems and management issues, identify the origin of contradictions and their root causes, select solutions to problems, provide novel ideas and problem solving strategies, and evaluate the final result. This approach always organizes and updates the innovative problem solving tools for application in the technological systems. In addition to the standard tools for problem solving theory, this process uses paradox analysis originator techniques, comparative ranking scorecard and multi-criteria decision matrix, and to further improve the solution provided by the principles and Modern techniques do not hesitate. The Advanced TRIZ Process is represented in Fig 1. Each process is backed up by techniques that have been systematically introduced from previous steps and outputs are provided to enter the next steps. In this process, the assumptions and decisions made in the previous steps are returned to the desired stage with respect to the feedback loop shown in the figure, and correction operations are performed on them, so that the next steps follow the standard one after the other (Ruchti, 2001).

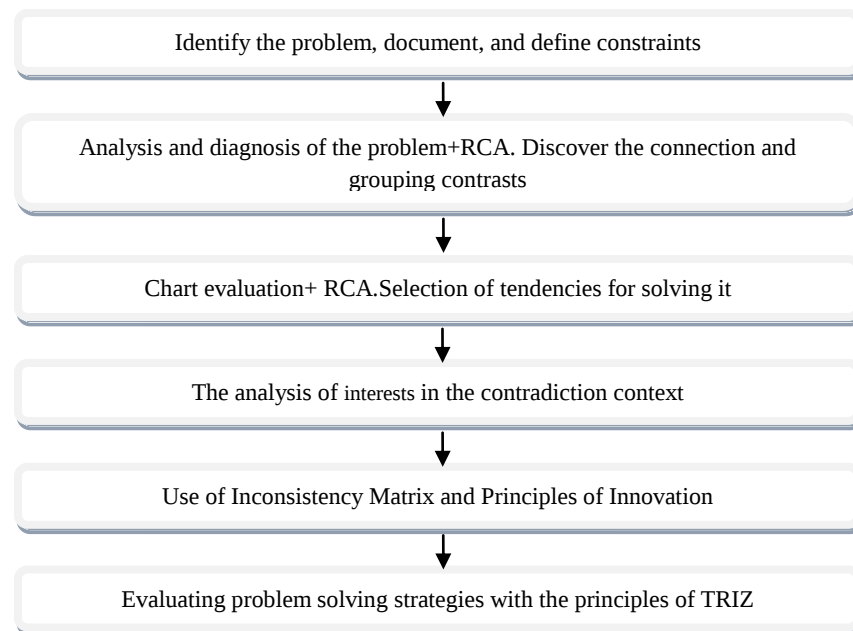


Figure 1. Advanced TRIZ process

4.3 Origin of paradox analysis

The origin of paradox analysis is an innovative technique for analyzing issues and problems whose main purpose is to extract conflicts from issues and present them in the form of a tree structure. The origin of the paradox analysis is designed from top to bottom, and its starting point is a negative result. The trend chart itself goes down to the bottom by specifying the various causes and effects of the negative result and understanding whether the reason is controversial. One of the main advantages of the plot of the origin of the paradox analysis is to stop at a level of tree structure, which, for the reason stated, requires the greatest contribution to the problem without the need to discover any other possible reason (Souchkov, 2005). In the chart, all negative effects with negative sign, positive effects with positive sign and contrasts with positive and negative sign are shown. There are two kinds of relationships between these effects. The relation "or", when two or more independent reasons lead to a particular effect, show themselves as flashcards of two or more different reasons for the same effect in the form and the relation "and" In which the causes and effects with each other and without the possibility of another deletion effect. The small orange drives in the chart represent the relation "and". Due to the large number of conflicts, it is not possible to analyze all of them. Therefore, there are three strategies for choosing and eliminating conflicts. By choosing the first conflict at the highest and the conflict that is at the bottom of the graph or a combination of these two strategies, the phases of the

analysis of the betrayal begin. Finally, it can be said that by solving the conflicts at the upper levels of the graph, we will find short-term solutions and identify long-term and root-level solutions through solving the low-level conflict of the chart (Souchkov, 2006). Regarding the ability of the origin of the contradiction, as one of the new tools of the innovative problem-solving theory, to solve the problem of the lack of development of technology, with the consideration of expert experts about the basic principles of technological development and according to the research that was carried out beforehand, the following model is presented as the main pillar of this tool for solving and reviewing the best possible strategies for solving this problem during various processes.

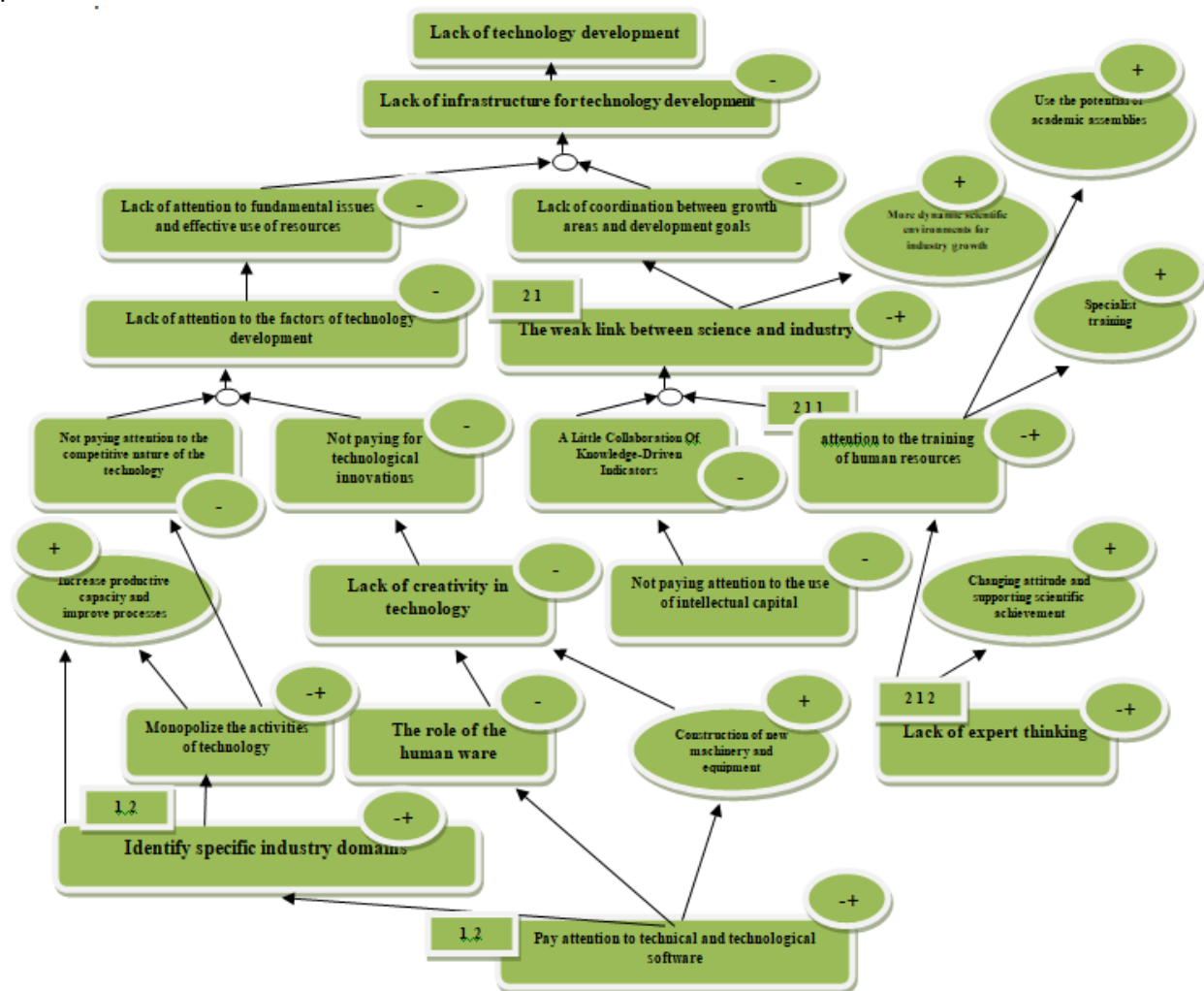


Figure 2. Paradigm Analysis Origin Algorithm for solving the problem of non-technological development

5. Conclusion

The purpose of the present research was to develop creativity and innovation and its role in the development of technology. After collecting information and analyzing them it can be stated that the process of knowledge growth, countless quantitative and qualitative methods for decision making, planning, designing Strategies and problem solving. However, the innovative problem-solving theory with two classical and advanced Trice approaches has been able to discuss with its systematic tools a variety of issues, including the issue of the lack of technological development. The process of the origin of paradox analysis for this issue can provide appropriate solutions in the long-term perspective. The study of root causes and the use of scorecard and multi-criteria decision matrix emphasize the reliability of solutions provided by this method. Therefore, in order to eliminate the lack of technological development, it is better to pay attention to the technical dimension of the human dimension as well to be.

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