Application of TRIZ in Literature; an Algorithm for Systematic Story Writing Based on Mega Problems

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Abstract

Stories have always been an inseparable part of human beings' life. They are a robust instrument which humans exploit to enjoy pleasure and transfer various concepts. Therefore, creating a charming story has always been valuable. Nevertheless, writing a compelling story is arduous and time-consuming. This paper by considering the stories as a realm of encountering characters with problems (bringing stories to the problem-solution space) have used problem solving and structured innovation material to create a systematic algorithm for story writing. The algorithm has been designed based on TRIZ tools and principles. TRIZ, theory of the resolution of invention-related tasks, was introduced by Genrich Altshuller and his colleagues in 1946 in the former USSR. It is a set of tools, methods and strategies developed by years of research and studies of ample patents in order to scrutinize the problems and propose ideal solutions. The proposed algorithm would ease the process of story writing and presents a new specific discipline which the author could systematically write copious stories based on problems. The algorithm includes five certain steps including: 1- identifying a problem and discovering its logic, 2- defining characters and establishing a functional diagram 3-creating story line by exploiting conflict loop, 4- designing climax and terminating the story 5-rewriting and extracting long story from it.

Keywords: TRIZ, structured innovation, storyline, systematically writing

1. Introduction

1.1 About stories

Stories have always been an inseparable part of human beings' life. Every day in all of the world, copious story books are leafed, thousands plays are performed and hundreds of films are screened. From the stories which is narrated for children during bed-time to stories which is told by leaders for their followers to inspire them, all are evidences that story is a robust instrument which humans exploit to enjoy pleasure and transfer various concepts. As a result, creating a charming story has always been valuable. Some believe that story writing is intrinsic affair in which authors deliberately create them by their feelings and experiences. Others believe authors should know special forms and rules to narrate attractive story. These rules have been mentioned on numerous books about story writing. (Field, 1982) is a well-known book in definition of a structure for story writing. The structure is called three-act structure in which story begins, then challenges increases until the climax point then by solving climax the story terminates. (McKee, 1997) is another popular book for story writing. The book immensely describes details of structures. The concentration of the book is on designing conflict and aesthetic aspects of the story. Besides structures, the book elaborates ideas, problems and characters meticulously. (Mirsadeghi, 1987) is an appropriate book for critical thinking in stories.

A major part of the book has also dedicated to creation of tensions in the story. Most of the books in the subject of story writing teach some rules and tips.; However, Comprehending and applying these rules are usually arduous and time consuming. Furthermore, there is no guarantee that after reading these books people can create stories. In this regard, this paper arises cardinal question, whether it is attainable that instead of rules individuals use some tools for writing stories. In case some distinctive tools are defined for story writing, individuals can create stories by consuming little time and energy.

1.2. Process of story creation

Stories are usually created after four distinctive stages (McKee, 1997; Mirsadeghi, 1987).

1- Finding facts

In this stage the author intentionally or unintentionally begins to store the information from peripheral environment.

2- Ignition the spark

In this level the author come up with an idea and extends it with the previous stage's material (information). In other words, s/he enlarges the idea with the facts which has been established in his/her mind.

3- Imposing a structure

For becoming stunningly attractive, the story needs a distinctive structure. In essence, the author should design diverse challenges which characters should encounter with them.

4- Designing climax

To finish the story, the author increases the quality and quantity of the problems. Therefore, by solving these impediments considerable amount of pleasure is provided for audience. In this while the audience is satisfied for wrapping up the story

If we design some tools instead of every stage, we can pass the stages successfully and create a story. For this purpose, TRIZ can be a breakthrough. TRIZ is a set of tools which has been designed for structured innovation. To put it differently, by this theory people can create innovation systematically. Since stories are also creative task, maybe it is possible that the tools of TRIZ extends to the realm of story writing.

1.3. TRIZ methodology

TRIZ is a systematic way of thinking for solving problems (Savransky, 2000). It is a set of tools, principles, algorithms and strategies developed by years of research and studies over millions of innovations (Mann & Domb, 1999). This knowledge-based systematic methodology of inventive problem solving was introduced by Genrich Altshuller and his colleagues in 1946 in the former USSR at first. Then it became widespread in the scientific concepts in the world. The theory is usually applied to solve the technical innovations but recent studies have shown that TRIZ principles are also doable to management fields (Mann & Domb, 1999; Retseptor, 2003). In this methodology, Researchers by scrutinizing the wide variety of innovations such as patents elicit their conventional principles which play a key role in their innovations. Next, they employ these principles in developing other systems via especial distinctive tools (GS Altshuller, 1986; Genrich Altshuller, Al′tov, & Altov, 1996; Rantanen & Domb, 2010) This process is also called structured innovation. This paper aim to exploit TRIZ's tools for structuring the stories and designing an algorithm in which people can create stories systematically. In addition, Since TRIZ is a problem-solving method, it considers concepts in space of problem-solution. As a result, the concepts of stories should be transferred to problem-solution space to be analyzed in TRIZ methodology. For this purpose, the stereotype of story is redefined in this space.

1.4. Stories as a realm of problem solving

Human beings have always been solving their problems any time in his/her life from birth to death. From the toddler who intends to walk by his/her feet to the old man who has been hospitalized and is fighting against his disease, all of them are solving their problems. In essence, the life is a scene of problem solving. Human beings are always encountering new problems and attempting to act accordingly. Thus, if stories have been considered a dramatic model of real lives (Mirsadeghi, 1987), it can be said that they are amazing narrations about encountering among characters and their problems, and surveying their solutions for solving them. In the other words, the stories are the abstract realms which the characters are faced with major and minor challenges and have special interaction with each of them. While the character is tackling the difficulties, the audience is also unintentionally experiencing the same problem and seeking the solution with him/her in the story. This process (facing with problems and making solutions) creates conflict for the audience and entice him/her to follow the story (Forouzanfar, 2018; McKee, 1997; Mirsadeghi, 1987). To put it simply, writing a story is exposing the characters to different kinds of problems and assessing their reactions in the

situation. As a result, if it is possible to design a discipline for bringing a problem and putting some characters against them and then analyzing the characters' reaction for each, it will help to present a special algorithm for writing story lines.

1.5. An algorithm for story writing

As it was discussed, there are four stages for creating a story. If some special tools are employed in order to help author to pass these four phases s/he can create a story. For this purpose, we have chosen some robust tools in which individuals can carry phases effortlessly. An especial algorithm has been yielded by sequence of these tools. This algorithm includes 5 steps as follows: 1- identifying a problem and discovering its logic (which is equal with first stage), 2- defining characters and establishing a functional diagram (which is equal with second stage) 3-creating story line by exploiting conflict loop (which is equal with third stage) 4- designing climax and terminating the story (which is equal with forth stage) 5-rewriting and extracting long story from it (see figure 1). All of these steps and their tools will be described in the following paragraphs. After that, two stories are unfolded as a case study.
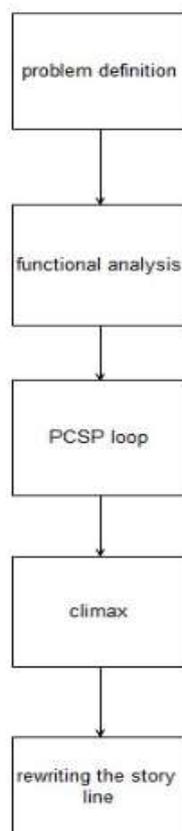

Fig. 1. The levels of the algorithm

2. Algorithm steps explanation

As it was said earlier, the stories were considered as a realm of problem solving. The elements of the story are involved in a problem and they try to clear it up, the idea is that the author should scrutinize a distinctive problem then s/he should create some characters and analyses their interactions in this space. As a result, the proposed algorithm has five steps so that the author can both penetrate the depth of the problem and create a story by TRIZ problem solving tools in an effective manner. Then eventually s/he can terminate it by system theories principles.

2.1.　　First step: definition of the problem using the cause and consequence diagram

At first, a problem should be chosen and then it should be unfolded. This problem can be any enormous obstacle in human's life like injustice, unemployment, global warming, etc.　To perceive the logic of the problem effectively, the cause and consequence diagram is recommended (Aurisicchio, Bracewell, & Armstrong, 2013; Lee, Chechurin, & Lenyashin, 2018; Okes, 2019; Pinyayev, 2007; Yuniarto, 2012) Not only is this diagram the most powerful tool for unfolding the cause and effect structure of the problem, but it also is one of the best tools to investigate the problem and its effects in every system such as society (Okes, 2019). One of the considerable advantages of employing this diagram is piercing the depth of the problem incessantly and analyzing the root of the problem (Lee et al., 2018). Figure 2 demonstrates an unfilled form of the diagram. The problem statement is posed in the center of the structure and the causes and consequences are written hierarchically. In the diagram, any causal level is constituted by asking "why" question from previous level so that the diagram is developed gradually (Pinyayev, 2007). The diagram, called logic tree in the root cause analysis methods, is the key tool for perceiving the logic of the problem (Okes, 2019). The main advantageous of the diagram is that the mind of the author unconsciously settles in the space of the problem by fulfilling the cause and consequence diagram, that is the author is discerning the structure of the problem and analyzing it closely.
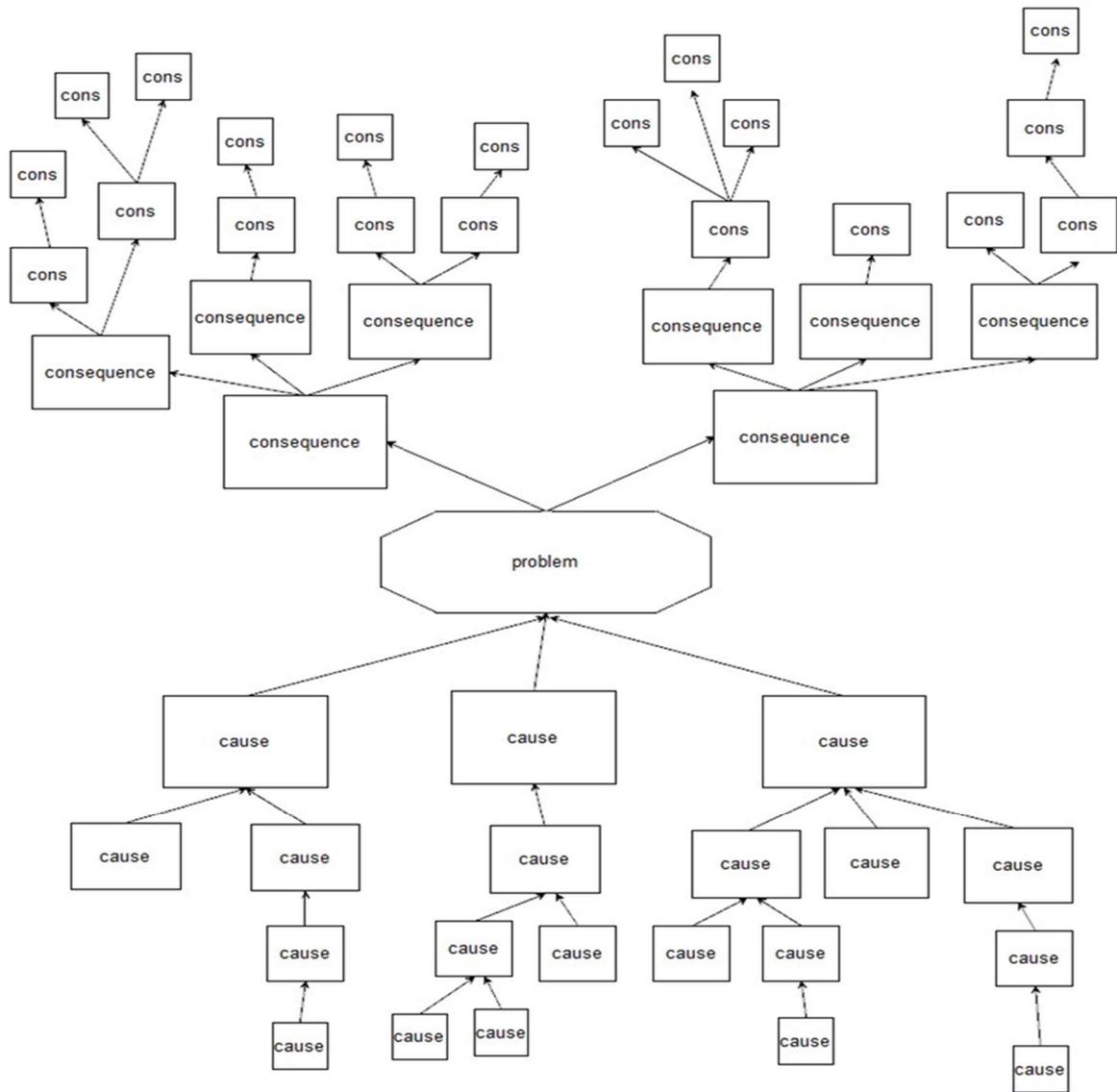
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Fig. 2. Problem space

2.2.   Second step: functional diagram

When the logic of the problem is determined, the material has been actually prepared for creating the story. Now, the author can create the story line by these materials. To pursue the goal, one of the exceptional tools of TRIZ called functional diagram can be employed (Abramov, 2015; Aurisicchio et al., 2013; Delgado-Maciel, Cortés-Robles, Alor-Hernández, Alcaráz, & Negny, 2018; Rantanen, Conley, & Domb, 2017). The diagram considers the elements of systems and surveys their functional relationships

4
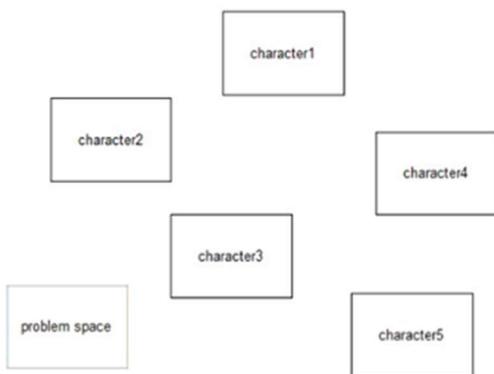
2.2.1. Elements

The element means the physical ingredients of the story which either influences other physical ingredients or is influenced by other ingredients in the story (Rantanen & Domb, 2010). These ingredients can be whether human or nonhuman. Moreover, the ingredients should be chosen upon the problem. For instance, if the inequality was selected as a main problem, the elements should be determined around the notion of the problem such as some workers. If we consider some mongers as elements in this problem, the story will not be dramatic since the wealthy mongers cannot probably be exposed by the inequality. If the global warming was chosen as a problem, it would be recommended that the author uses characters related to the sea or farmers since these people are influenced by global warming directly (rising the sea level ruins cities and trades or warming the atmosphere which spoils the crops).

2.2.2. Relationships

Four kinds of functional relationships can be defined between each two elements. These four types are pictured in figure 4 including useful sufficient, harmful, useful insufficient and useful excessive functions (Rantanen et al., 2017). These types will be described by an instance. The useful one means appropriate influence from a character to another one. Consider a lecturer and students where the lecturer's responsibility is teaching just 3 chapters of a book, in case s/he teaches these chapters typically, the functional relationship is useful and normal (it is what is supposed to be) (See figure 5). Such kind of cliché and common relationship is copious in life. However, if the functional relationship between 2 elements is exactly opposite with what is supposed to be, the functional relationship is totally undesired and harmful. For example, the lecturer instead of teaching that 3 defined chapters poses some irrelevant absurd memories which are not proper to students. As a result, not only does not s/he perform the

duties, but also the educator teaches an irrational concept which is harmful (See figure 6). The insufficient functional relationship is a function done in the right way but it is not adequate and complete. Imagine the lecturer has just taught 2 chapters of the book. So, the function is in the right way, but it is insufficient (See figure7). The last functional relationship is about doing an act more than what should be done. Consider the lecturer teaches 4 chapters instead of 3 ones (see Figure 8). The idea is that some characters should be established in the space of the problem and then the relationships are surveyed among them. Often some ordinary relationships, in the space of the problem (when problem occurs) converts to aberrant one, these abnormal relationships are choices for the starting point of the story. Figure 9 is a sample showing a complete functional diagram.
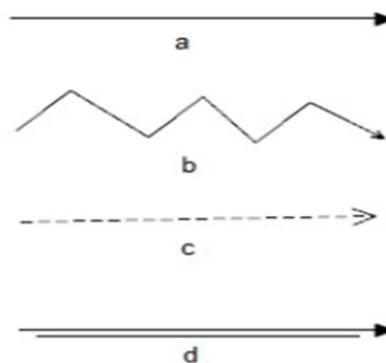

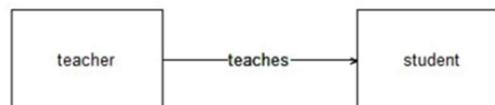**Fig 4.** Types of functional relationship between two characters
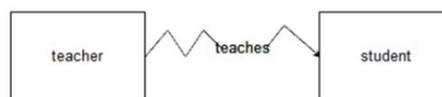

Fig 5. Useful (normal) relationship

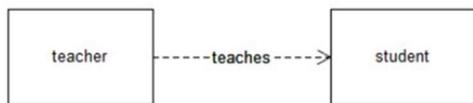

Fig. 6. Harmful relationship

5

Fig. 7. Harmful relationship
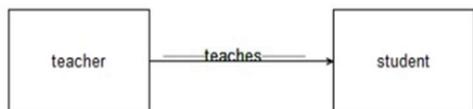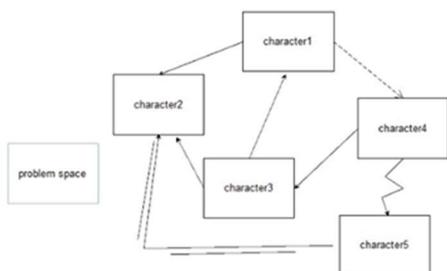

Fig. 8. Excessive function

Fig. 9. Completed sample of the functional analysis diagram

2.2.3. Direction of arrows in functional diagram

The direction of arrows in functional diagram is from an influencing element to influenced one (Fey & Rivin, 2005). If the lecturer is teaching students, the teacher will be regarded an influencing element and students are influenced one. Therefore, the direction can be from lecturer to students.

2.3. Third step: conflict loop

Conflict which is the confrontation of different characters or forces through the story is not only the foundation of every narration, but also the most important factor of the story which can persuade audiences to pursue the story until the end (McKee, 1997; Mirsadeghi, 1987). In 2.2, the potentiality for creating the story was determined. Now this potentiality should be turned to the story. Conflict loop could be a suitable tool for this goal. The loop, inspired TRIZ literature (GS Altshuller, 1986; Salamatov & Souchkov, 1999; Savransky, 2000), consists of 4 segments which are: problem, contradiction, solution and progress. The idea is that the character encounters with the special problem, then the contradiction in the problem is appeared, after that a solution is created and the character experiences new phase of the story. In this new realm, another new problem is created then contradiction and solution are followed,

then new other phase is appeared again and this loop continues repeatedly. In case the author tends to terminate the story line, s/he will use the next step which is designing a climax, to finish the story. These 4 parts of conflict loop cause an appeal in the story for the readers. In the following section, each part of these loops will be explained.

2.3.1. Problem

A problem is an abnormal relationship (all sorts of relationship except useful one) which has been created between two characters. A functional diagram is a significant tool to detect the problems but sometimes in the flow of the story the problems appear one by one and there is no need of using it. If the functional relationships in the functional diagram are totally normal, the author can change the situation or characters in the story to create some abnormal functional relationship. Moreover, each problem has some inner contradictions. The author should determine and reveal the contradiction in the problem and make the conflict.

2.3.2. Contradiction

If improving a situation of an element deteriorates a situation of that or another element, a contradiction has been created (Salamatov & Souchkov, 1999). The contradiction can be formulated such as the character 1 should do the act A for the reason B and simultaneously the character 1 should not do the act A for the reason C. every problem inherently has especial contradiction. The author should elicit the contradiction from the problem and obviously indicate to the audience. In essence, s/he should reveal that the character has to do an act and should not do it (The character is in a severe dilemma.). The stronger contradiction makes a stronger conflict. Three kinds of contradiction will be defined in the following part.

2.3.2.1. Administrative contradiction

Administrative contradiction means something should be done in order to avoid an undesirable phenomenon, but it is not determinable how it should be done (Savransky, 2000). For example, consider a young man who understands that her mother has a rare heart disease and she has to be operated and she should have her heart exchanged. Although this operation should be done so fast, their turn for exploiting from organ donation facilities is too late. Thus, the heart should be operated soon to survive the mother, but nobody knows how they can do it fast (An administrative contradiction).

2.3.2.2. Technical contradiction

In technical contradiction, an action is simultaneously useful for some elements and harmful for

6

some other ones (Savransky, 2000). The amplification of the useful action or the recession of the harmful one for some characters leads to deteriorating the situation of some other characters. In the other words, if an action is done, the situation of some characters improves and the situation of some others worsens. In the anecdote of the ill mother, for instance, the son finds a smuggler group who imports and sells organs of bodies. So then if he does not buy the new heart for his mother, she will die. But if he buys a heart from the smuggler group, another innocent person will be killed. As it is obvious, improving the situation of an element destroys the situation of another element.

2.3.2.3. Physical contradiction

In physical contradiction, a character should execute action A to improve his/her situation and should not do action A or should do anti-A to prevent deteriorating her/himself (Savransky, 2000). That is s/he should and should not do a special action at the same time. In that example, consider the poor boy has decided to buy a heart from the body organ smuggler but just one day before purchasing, he dreams about an innocent African teenager who has been captured and transferred to operations room. So, he extremely feels guilty. As a result, if his mother dies, he cannot forgive himself and if he buys the heart, this guilty feeling will kill him. Hence, he should and should not simultaneously buy a heart. This is a physical contradiction which is done on just one element in the story.

There are two points that should be regarded here. First of all, any type of contradiction can turn to another type (Savransky, 2000). As it is crystal clear in the story of mother's heart, the administrative contradiction was shifted to technical one and then was changed to the physical contradiction. The second point is that the administrative contradiction is the most powerless contradiction (Savransky, 2000). Instead, the physical one is the most powerful type in creating conflict. Therefore, it is highly recommended that the author should not consider a solution for administrative one and leave it to mature enough. The administrative contradiction can gradually convert to technical or physical ones without difficulty and creates stronger conflict.   Now this contradiction should be solved, so it needs a solution. In the following section, the solution of the contradiction will be described.

2.3.3. Solution

The author should design a solution to solve the contradiction. This solution can be performed using two methods. First, it can employ a heuristic or creative approach such as exploiting TRIZ and ARIZ and second, it can involve the character of the story in one spectrum of contradiction (GS Altshuller, 1986; Genrich Altshuller et al., 1996; Al′tshuller, 1999; Bertoncelli, Mayer, & Lynass, 2016; Fey & Rivin, 2005; Forouzanfar, 2018; Savransky, 2000). For example, in the story of the sick mother, if the author uses spectrums of contradiction, the boy should choose between his mother and another innocent person; depending on the choice, the story will be continued. But the author could consider TRIZ principles or ARIZ sources to solve the contradiction and choose a solution such as finding some person who claims can heal this disease by special traditional herbal treatment (field sources in ARIZ) or by the use of some artificial smart heart which is invented by the scientists in the field (principle 40 of TRIZ).

2.3.4. Progress

The author had arranged a complete contradiction to entangle the audience in the story and then s/he constructed a solution. So, the audience is looking for the effects of this solution on the problem at this moment. Is this solution enough robust to solve the contradiction? Or would it be a bitter defeat? If the solution is successful, what would be followed?

Progress is a series of events which consequently appear after working out the solution (McKee, 1997). That is, in the progress level, the story line enters new phase and proceeds in this. There are two kinds of progress: static progress and dynamic one. In the dynamic progress, the solution can solve the contradiction so the author outlines a new problem in this new phase of the story and again reveals a new contradiction and designs another solution and comes up with new progress and this goes on. But in the static one, when the solution is appeared and the story proceeds, it will be unfolded that the solution can not clear up the contradiction so the problem is consistent and the contradiction comes back again. While often short stories and classic scenarios for movies exploit static progress more, occasionally novels and series' scenarios use the dynamic progress or the combination of both of them in the outline of their stories. This loop (problem -contradiction-solution-progress) is endlessly repeated until the author intends to terminate the story line. To ending the story designing a climax is crucial.

Table 1. The definition and the responsibilities of the subsystems.

Name of subsystem	Definition and Responsibility
The working tool	The working tool performs the primary function. The main operation fulfills the role of the working tool.
The Engine	As a rule ,a working tool is useless without a source of energy and/or engine that enables the working tool to perform its functions.
The transmission	transfers the initial energy to the working tool
The Control	Regulate and manage other subsystems; make it possible to change energy and substance flows between other subsystems of technique.
The Case	Protects system and environment from each other, provides safety , furnishes aesthetics, and maintains the structure and shape of the TS. The shape of the casing is the most important for technique users for comparing with shapes of other major subsystems.

2.4.   Climax

If the author wants to wrap up the story line, s/he needs to design a climax. The climax is the final part of the story which maximum intellectual conflict is fabricated for audience in this spot. At this section, the highest pleasure or pain is transferred to the mind of the audience and satisfies audience for finishing it (McKee, 1997). To design climax, the character or characters of the story should face with enormous and complicated problems from every aspect of the story so that the audience cannot believe the character may overcome the problems and releases him/herself from this tumult. To design climax, the principles of system theory could be beneficial, each system in the world has some special subsystems (Savransky, 2000). These subsystems include working tools, engine, link, controller and case, table 1 describes these 5 subsystems, the idea is that these subsystems should be determined and one or more of them have to be deteriorated so that the character completely encounters serious and complex problems. It is recommended that the solution of problem's climax be the planted information used through the story (Forouzanfar, 2016; McKee, 1997).

2.5.   Step 5: extracting long story

In this level, the story line should be rewritten and some features or elements should be either added up or cut so that the story shifts more dramatically and the novels or screenplay can be extracted

3. 2 Case studies

In this section two case studies will be scrutinized. The first one is about creation of a new story based on the proposed algorithm and the second one is about the analysis of an already written story by the suggested model.

3.1 First case study, creation a story based on model

Since the corruption and inefficiency in some parts of Iranian government are one of the controversial problems in Iran; this was chosen to create a story line.

3.1.1   First step: problem definition

Figure 10 demonstrates the simplified cause and effect diagram for the problem(Ali, 2007; Ghaderi, 2009; Maghsoud Najafi, 2012; Majid, 1992).

3.1.2   Second step: functional analysis

The diagram should be included story elements and functional relationships in the space of the problem. Since the problem is about inefficiency and lack of flexibility of government system in solving the people's problems in some public organizations, a novice, who has been hired recently and has not been accustomed to this system, is considered as a first character to demonstrate the inefficiencies in the system. He works at a public office and as a result, his relationship to this space can be appropriate for initiating the story.

As it was mentioned, since the person is a beginner and he has newly been entered the state system, in spite of his other colleagues, not only does he perfectly perform his duties but he also guides all clients enthusiastically. He neither accepts any bribe nor does he commit any illegal deed. However, his colleagues think and do oppositely. So, there is a serious conflict between this novice and veterans. The conflict provokes dispute between him and hi0s coworkers. The first character is named Ehsan. Figure 11 shows the functional diagram of the story.

8

Fig. 10. Cause and consequences diagram

Fig. 11. Functional analysis diagram

3.1.3 Third step: conflict loop

Conflict in a story is created by contradiction, so if the author can both bring a problem for character and explain it as a contradiction, he will create conflict for audience. Next, producing solution is required. The solution can involve the hero of the story into a spectrum of the contradiction or guide him/her to a heuristic and creative one by exploiting TRIZ, ARIZ, etc. Presence of both solid contradiction and desirable solution puts the story into a new phase. Therefore, the author after rambling on this new realm of the story, poses a new problem and repeats this loop.

As mentioned above, the problem in this story is inefficiency and corruption in the public offices. The

novice, named Ehsan, has not been formed in this perverse system. Thus, he has a dispute with his colleagues. The story begins by this problem:

Problem:

Ehsan's coworkers suffer from his performance and are annoyed by his inconsistent behavior. Not only does not he accept any bribe but also, he does his job perfectly. Ehsan's deed is deteriorating the organizational culture.

Technical contradiction:

If Ehsan carries out his duties truly, he won't feel guilty and have clear conscience (+).

If Ehsan carries out his duties truly, his colleagues could be accused of inefficiency (-).

Solution:

One of his colleagues, named Nima, creates a serious quarrel with him through the story and although Ehsan was in the right side, the manager advocates Nima and transfers Ehsan to archive section of the office.

Progress:

The archive section is too chaotic, Ehsan restores discipline to the section. He reforms the process of archiving in the office and someday, while the president of the organization inspects the archive section, he clearly perceives its effective changes, meanwhile, the manager of the section pretends that all of this reformation was for his exceptional performance. So, the president extremely encourages him. Then, in the next week, a special feast for selecting the worthy employee is held and Nima, who did not do his duties at all and had a quarrel with Ehsan, wins the prize of the best employee.

Problem:

Ehsan detests this job and the public office.

Administrative contradiction:

Ehsan should quit this job to gain tranquility (+).

Ehsan should not quit the job since he doesn't find any other appropriate job (-).

Solution:

Note: Since administrative contradiction is the weakest type, it is not recommended to create a solution since it is matured and turned in to other types of contradiction.

Progress

Ehsan seeks a new job but he cannot find one. He suddenly visits one of his old friends who has recently launched a company to import and export the

9

commodities. Ehsan decides to help him and work in his company. Every day after his official work, he goes to his friend's company and searches about the neighboring international markets. This auxiliary job becomes more and more serious, so Ehsan has to perform some of his occupation during his primary job. As a result, he cannot perform his duties completely, so his boss admonishes him regularly. The boss decides to write an official letter and oust him from his division.

Problem:

Ehsan is losing his main job.

Physical contradiction:

He should hold his job, because his second job is not enough mature to earn adequate money (+).

He should not hold his job, because he neither can bear admonishing his boss nor can he tolerate the air of the office (-).

Solution:

Ehsan finds out his boss owed a huge debt to the bank, and he cannot wipe off easily. So, Ehsan requests a low-interest loan from another bank by his businessman friend for his boss.

Progress:

Suddenly all of the bitter critics is cleared. Hence, he can freely do his private occupations in the working time. Ehsan finds out, he can reach some confidential data about the most important needs of the people and the country via his accesses in archive section. So, he and his friends begin working on it and import commodities which are very crucial for the people; hence, they obtain enormous benefit from this confidential information. The more his second job becomes serious, the more he cuts his duties in the public office to do his second profitable job. Someday, several extremely important files are missed in archive division where the responsibility of the defect assigns to Ehsan. This catastrophe and other critics from his performance prompt the president of the organization to call him and say he is fired.

Problem:

He is being fired.

Physical contradiction:

Ehsan should not hold this job since he neither has any enough time to do this tedious official job nor does he need its low wage (-).

Ehsan should hold the job since he can reach some confidential information which ordinary people cannot obtain it (+).

Solution:

Ehsan realize the president's son is unemployed. So, he offers him a well-paid job, and the son accepts.

Progress:

Not only is he faced with the case of firing, but he also will be chosen as the best employee of the next month. Besides, the president promotes him as a manager.

Note: since there is not any idea to continue the story, another functional diagram is drawn to find some problems in this phase of the story. Figure 12 shows the situation of the elements and their functions. As a result, since one of the considerable problems is still the Ehsan's performance, we can continue the problem in another form.

Continuance of the progress:

Ehsan does not work appropriately in this new position either. So numerous clients complain about flaws and weakness of his performance. Inspection section of the office prepares an extensive report about Ehsan's performance and sends it to the president of organization. The president seriously talks with him, but Ehsan ignores his warnings. The boss of inspection section sends another letter to the president in order to dismiss Ehsan and if the president doesn't act accordingly, he will probably send it to the minister. The president has a great problem.

Problem:

Ehsan's performance

Physical contradiction:

The president should depose Ehsan; otherwise, he should face the consequence which can be a scandal for him in case the minister becomes aware of his inefficiency in managing his employees (+).

The president should not depose Ehsan, because Ehsan will fire his son (-).

Solution:

Ehsan is removed from his job, but he is assigned to supreme adviser of the president.

Progress:

He is now the nearest person to the president. Although he does not almost have specific duty, he intervenes in all of the procedures and now he is the most powerful man in the organization after the president.

3.1.4 Third step: Climax

Figure 13 demonstrates subsystems of the story based on the information revealed up to now. To design a climax, the author should ruin all or

some pieces of these subsystems so that the air of the story becomes complicated, then the audience could not imagine a solution for such a situation. Thus, according to figure 13 it can be said:

The president shifts (destroying casing) and one of the organization's manager promotes to the president. The new guy totally knows Ehsan's precedent. So, at first, he decides to suspend him from his position (destroying link) and demands from inspection section to prepare another comprehensive report about him. This news spreads in the organization. Therefore, organization's managers prevent communicating with Ehsan (destroying engine). So, he loses his credit and information sources. Ehsan requests resigning his job, but the president does not accept and says he should wait until the end of investigations. Some days later, Ehsan hears a large impeachment is preparing for him. He is really messed up (destroying his control). As a result, he meets with a major accident in the street and his hand is broken (destroying working tool). He is hospitalized immediately.

Solution for climax

As it was said, planted information mentioned in the story can be applied as the solution of the climax. So, it can be mentioned that in the hospital, the manager of archive section (whom Ehsan had prepared a loan for) comes to visit Ehsan. He says Ehsan's situation is too awful, but he can help him. He says he has found some documents in the old files which can prove that the new president has been involved in a corruption several years ago. Ehsan obtains the data then he reveals them to both newspapers and lawmakers. The president is fired and Ehsan promotes as the president. Ehsan immediately designates the archive manager to his vice president.

Some years later:

One of the lawmakers is speaking in the Parliament, he yells: the proposal minister has been a government official since 23 years ago, so how could he have created this wealth? How could he have accumulated 90 million dollars? Then Ehsan aged and has gray hairs, begins to speak: it is a big lie. I do not have enough money to pay the expenses of my son's college, I just have an old car and a rental home. An old man among lawmakers stands (he is a man who was the manager of the archive section and helped Ehsan.) and shouts he is totally right. I have never seen such an honest man in my life.

3.2   Analysis of the story

This story line was systematically created by the algorithm. As it is obvious, the author can complete the structure of the algorithm by his creativity;

however, the special way for channeling the story has been prepared. In this sample, the functional diagram was used twice, but if it will be essential and in the lack of idea, the author can exploit more functional diagrams to trigger his mind for new ideas. The story has 5 conflict loops. In the second loop, the administrative contradiction was used and it was left to be mature. We used just a few characters and loops to create a short story but it could be more if the author tends to develop it. For example, Ehsan's wife or his son can be entered in the functional diagram and create new problems. In the climax, all of the five subsystems were both detected and destroyed to constitute a climax an then it was solved by the planted information.
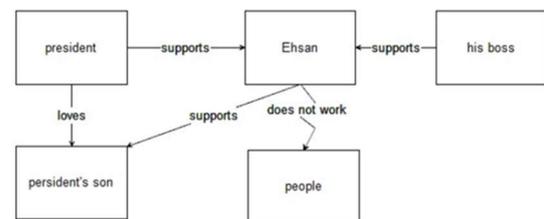

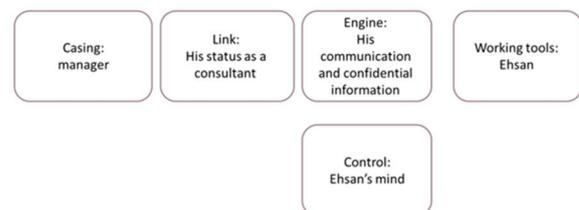**Fig. 12.** Functional diagram of Ehsan's situation

Fig. 13. Subsystems of Ehsan's situation

3.3 Second case study: Analysis of 12 years a slave

If the proposed model is true, it should accommodate with already written stories properly. Thus, in the second case study, a famous story about slavery period in USA will be analyzed according to the suggested model.

Twelve Years a Slave is an 1853 memoir and slave narrative by American Solomon Northup as told to and edited by David Wilson. Steve McQueen directed a movie based on the book in 2013. The movie received widespread critical praise and was named the best film of 2013 by several media outlets and critics. The film was awarded the Golden Globe Award. British Academy of Film and Television Arts recognized it with the Best Film. 12 Years a Slave was later named the 44th greatest film since 2000 in a BBC poll of 177 critics(contributors, 2020, December 29).

11

In the following, the summary of the story will be explained at first, then the analysis of the story according to the algorithm will be described.

3.3.1 the summary of the story

Mr. Solomon was born a freeman in New York. He is married with two children and is an accomplished violinist. Two men entice him to Washington, D.C., with the promise of a high-paid job playing music in a circus of sorts. They drug him and deliver him to a slave pen, from which he is shipped to New Orleans and sold by a slave trader as a runaway slave named Platt to a relatively kind plantation owner, Ford. Mr. Solomon incurs the enmity of Ford's carpenter. He arranges to have Mr. Solomon lynched, but Ford stops the lynching. Because of carpenter's hostility, Ford sells Mr. Solomon to, a particularly vicious and alcoholic plantation owner(Bauer, 2018).

On Epps's plantation, Mr. Solomon becomes friends with another slave, Patsey. Epps pays particular attention to Patsey, often expressing his obsession by raping her. At one point, Epps decides that Patsey has earned punishment, and he forces Mr. Solomon to whip her. Solomon's repeated attempts to regain his freedom finally yield success when Bass, a Canadian abolitionist working as a hired hand for Epps, is convinced that Mr. Solomon's story is true and alerts the authorities in Solomon's hometown of Saratoga Springs, New York. A sheriff arrives and he is released(Bauer, 2018).

3.3.2 Analysis of the story according to the proposed model

The model includes five steps for creating an outline for the story. The first and second step is for detecting an idea and fostering it. Since this story has already existed, we cannot investigate these steps which were cause and effect and functional diagrams. in the following, conflict loop, climax and designing its solution will be demonstrated.

3.3.2.1 Conflict loop analysis

The story begins when a free black musician man, Mr. Solomon, is kidnapped(SparkNotes).

Problem:

Mr. Solomon awakens he finds himself in chains as a slave.

Administrative Contradiction:

Mr. Solomon have to be freed since he is not slave (+).

Mr. Solomon doesn't know how to free himself (-).

Solution:

He clearly explains who he is and talks about his freedom for the people who have captured him.

Progress:

As a response he is subjected to torture to accept he is not a freeman.

Problem:

He is receiving harsh punishment

Physical contradiction:

He has to accept he is a slave to escape the punishment (+).

He does not have to accept being slave since he would deny his freedom (-).

Solution:

While He does not accept being a slave inherently, he would not say anything about his freedom any more.

Note: as it is obvious, the solution which has been chosen is not based on the spectrum of the contradiction. as mentioned earlier, these types of solutions are creative solution.

Progress:

Mr. Solomon is not alone, there are some other people who have been stolen. One night, they are woken up in the middle of the night and made to board a steamboat to be sold in the other state.

Problem:

Mr. Solomon is too dismal and downhearted he cannot accept the situation.

Administrative contradiction:

Mr. Solomon should not be in a slave position since he is a free man (+).

Mr. Solomon should be in this position since he doesn't know how he can change the situation (-).

Note: since there is an administrative here, there is not considered a robust solution to solve it.

Progress:

On the boat, Solomon befriends a man, who, like them, has also been kidnapped and torn from freedom. The man works out a plan for escape. Whereas, the escape plan is so valuable, it is too hard to do it. After a while, the man is killed by masters. Others find out if they dream about escaping the only thing, they will be encountered is death. The passengers of the ship disembark in the port. Meanwhile, one of the slave's owners who had found his slave

has been stolen, finds the ship and liberates his slave by enforcing the law.

Note: liberation of the slave by exploiting the law is the planted information which will be used in the future for designing a solution in the climax.

Continuation of the progress:

A slave monger prepares slaves for auction. He names Mr. Solomon, Platt. From now on, Mr. Solomon becomes Platt and begins a new life. Luckily in the auction, Platt is sold to a kindly, wealthy gentleman named William Ford, an esteemed Baptist preacher from the Red River region of Louisiana. Platt and Ford travel to the Great Pine Woods to Ford's home. Ford proves to be a compassionate, gentle owner, and treats his slaves like his own children. He reads the Bible to them and teaches them to trust in God, who loves all children, free or enslaved. Platt decides to be a gentle slave for Ford to make more time for seeking a solution for his trouble. However, he has serious problems with Ford's carpenter. He forces him to labor tirelessly and is never pleased with Platt's work. On one occasion, the carpenter tries to whip Platt for using the wrong nails. Platt tackles to the ground and whips the master. As a result, He is severely threatened to death by a carpenter. He knows the carpenter will kill him.

Problem:

Platt will be assassinated soon if he stays there.

Physical contradiction:

Platt have to leave there since he will be killed if he stays there (+).

Platt doesn't have to leave there. Since by escaping, he will be followed by Ford's people and carpenter and they will definitely kill him (-).

Solution:

Platt waits.

Progress:

The carpenter and the two men come and prepare to execute Platt. When they slip the noose around Platt's neck and begin to drag him toward a tree, one of Ford's people runs out, pistol in each hand, and forces the men to leave the property. Nonetheless, it is not the end. Since the carpenter has been publicly insulted, he cannot forget the Platt.

Problem:

The carpenter is seeking for an opportunity to kill Platt.

Technical contradiction:

Mr. Ford should let carpenter to kill Platt for bringing about peace in the farm (+).

Mr. Ford does not have to let the carpenter to kill Platt, since Platt does not deserve such a harsh punishment. Besides, he paid much money for owning him (-).

Solution:

He sells Platt to another masters.

Progress:

Although Platt is initially relieved to be under new ownership, he quickly discovers that his new master, Epps, is much worse. Epps is a gruff, uneducated man who frequently overindulges in alcohol. He is a violent master, as he makes all of his slaves live in constant fear and prides himself on his ability to "break" slaves. One of Epps' slaves, a young girl named Patsey, receives particularly inhumane treatment. Epps frequently rapes Patsey.

Problem:

Platt is dismal and downhearted he cannot accept the condition.

Administrative contradiction:

Platt should not be in a slave position since he is a real free man (+).

Platt should be in this position since he cannot change the situation (-).

Progress:

After ages, a white worker who is not a slave comes to the farm to earn daily wage for working in the plantation. Platt finds a white worker and befriends him. A while later, Platt urges him to secretly forward a letter to his relatives. He accepts and vows to stealthily post the letter. However, he rapidly reveals the story for EPPS. The master goes to Platt with a knife and asks him for an explanation.

Problem:

The Platt's secret has been disclosed

Physical contradiction:

Platt have to confess since everything has been revealed.

Platt does not have to confess, since he would be killed.

13

Solution:

Platt says that the worker is a lier. Since he desperately needs money, he is lying to make EEPS hire him as an administrator of slaves.

Note: this is a creative solution. Actually, Platt has confessed (talked about the story) and in the same time does not have confessed (did not say the truth).

Progress:

EEPS is conceived so he disengages Platt. Some while after, a Canadian contractor named Bass comes to the farm to undertake a new construction project and Platt is also ordered to help. Bass is a middle-aged man with strong anti-slavery opinions.

Note:

This information is planted here to be used in designing a solution for the climax.

3.3.2.2 Design

Working tools:

Platt's body and abilities to work as a slave

Engine:

The hope of being free one day

Link:

Nothing

Casing:

A supposition that if you are a gentle slave you will have more power and respect. If unquestioningly obey the master, you would have more comfortable slavery life

Note:

For designing climax, the author destroys the casing at first. For this purpose, one of the best EEPS'slaves is going to be severely whipped until death. Further, the author will destroy the only hope of the Platt to finalize the climax.

Progress:

As in aforesaid, EPPS has a smart slave named Pasty, one of the best slaves of the farm. She also looks pretty. Epps frequently rapes Patsey. One day, EPPS cannot find her. Convinced that Patsey is secretly visiting a white man who lives nearby, Epps flies into a jealous rage. When the Pasty comes back to the farm. He ties Patsey's wrists and ankles. Brandishing his thickest whip, Epps forces Platt to beat Patsey.

Problem:

Platt has to whip Pasty

Physical contradiction:

Platt has to whip the Pasty since this is the master's command (+).

Platt doesn't have to whip the pasty since not only is she innocent but she is his friend (-).

Solution:

Platt gently whip the Pasty.

Note: the solution is creative one.

Progress:

Epps watches Platt's whipping, snatches the whip and tortures Patsey with even more forceful blows. He stops once Patsey is disfigured and nearly dead. From then on, Patsey's mental and physical health declined rapidly. Platt is pretty brokenhearted. He breaks his Violin. He is not able to bear the situation any more (destroying casing).

After a while, when he was working for Canadian contractor, Bass, he explains his kidnapping and wishes to escape. Risking his safety for Platt, Bass promises to write letters to Platt's contacts in New York. Several months go by without a reply, Platt feels dejected (destroying engine).

Final solution:

After ages, while Platt is toiling in the cotton fields, he sees a carriage rumbling toward the property. A sheriff and another man step out and ask which slave is named Platt. Coming forward, Platt is confused as to what the sheriff wants from him but is immediately overjoyed at the sight of his friend Northup. The sheriff and Northup settle Platt's release with Epps, who is furious and threatens to kill whoever sent the letter to Perry and Parker. Platt's release is finalized in court the following day, and Platt departs with Northup.

3.4 Analysis of the structure

The story is a biography which includes some administrative, physical and technical contradictions. The main problem which the story had been created based on, is the kidnapping of free black people and selling them as slaves. The minor problem of the story was also about the severity of the slave's life. The story has a great administrative contradiction

which is: Mr. Solomon should not be in a slave position since he is a free man and simultaneously, he should be in this position since he doesn't know how he can change the situation. The author has carefully designed the story in the manner in which he regularly demonstrates this contradiction. All other contradictions containing technical and physical ones occur in this main contradiction. As the main contradiction constantly duplicated, it has a static structure. other contradictions which solve during the flow of the story carry dynamic form. In the climax design two parts of subsystems are destroyed and then eventually the solution based on planted information comes and clears up the main contradiction.

4. Conclusion

TRIZ has always been a useful tool which helps in solving challenges in managerial and technical issues. The theory had provided a systematic method for solving technical and managerial problems and proposing creative solutions systematically. Since stories also are scenes of problem solving, the authors can exploit problem solving concepts to design stories. This paper applied TRIZ methodology to design an algorithm for creating story systematically by considering stories as a narration of character's problems. In the other word, the paper proved problem solving material can be useful in story writing.

Moreover, this study provided useful structure which authors can create story via some easy effective tools systematically. Therefore, individuals, especially beginners, can exploit painless simple systematic structure for creating stories instead of copious confusing rules and tips which has been discussed in classic books. The structure consists of some distinctive tools. The cause and consequent diagram used in this algorithm have been inspired from logic tree in root cause analysis which enormously helps author to find the logic of the problem. The functional diagram obtained from TRIZ literature is a suitable driver to scrutinize the situation of characters and identify a problem for creating the conflict. The conflict loop was designed based on TRIZ ideas in recognizing and solving problems and it develops the constitution of the story. Approaches of system theories in defining subsystems was another extremely helpful tool for making enormous and insoluble problem to design a climax.

5. Future researches

The algorithm which has been created according to TRIZ tools can ease the process of story writing. Individuals by identifying a problem and accurately following the algorithm can write outlines of stories without wasting time. Moreover, since the algorithm has been designed in problem-solution space, realizing and following the direction of the process is fairly more straightforward than classical ways of teaching story writing. in addition, if the writer is familiar with TRIZ theory, s/he would benefit copious TRIZ' tools and principles to organize creative solutions for produced problems. However, the algorithm has some flaws. First of all, the author can only create contradiction-based stories. There are ample stories which does not have fundamental contradictions. Thus, the proposed algorithm does not meet their requirements. In addition, the authors would not be able to write all genres of stories. For instance, the proposed algorithm is not helpful for creating comic stories. As a result, Future researches in this topic should concentrate on modifying the algorithm in order to clear up the flaws. Moreover, the authors of the paper are going to assess the effectiveness of the algorithm on the learning story-writing process for the inclusive range of pupils including literature and engineering students in their future research.

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15

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16