

# **AATRIZINVENTOR SOLUTION FOR INNOVATION BASED ON NATURE'S L.I. Working Document to Build a Specific Solution.**

**INNOVATION CHALLENGE: Improve telegraphic transmission affected by the complexity of the communication process**

**APPLICATION OF NATURE'S LANGUAGE OF INNOVATION / Nature's L.I.**

Web site: [www.aatrizinventor.com](http://www.aatrizinventor.com)

Reference book: The Nature's Language of Innovation, José Roberto Espinoza, Amazon, Kindle.

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## **FACTORS OF INNOVATION:**

**FUNCTION AFFECTED:** telegraphic transmission affected by the complexity of the communication process

**PHYSICAL VARIABLE OR CHARACTERISTIC:** Less Quality and opportunity in transmission

**S1 OBJECT: TELEGRAPHIC TRANSMISSION SYSTEM** Type: Stationary

**S2 OBJECT: SENDER'S MESSAGE** Type: Moving

**DESIRED ACTION VERB:** Improve

## **INNOVATION CHALLENGE:**

**CHALLENGE:** Improve telegraphic transmission affected by the complexity of the communication process

**DESIRED GOAL:** More Quality and opportunity in transmission

**EVALUATED OBJECT: TELEGRAPHIC TRANSMISSION SYSTEM**

**NEED TO SATISFY > 34. Ease of change, repair or maintain**

## **SELECTED INNOVATION PARAMETERS TO EVALUATE:**

### **A. UNDESIRABLE EFFECTS CAUSES OF DISSATISFACTION (UDEs)**

There are More difficulty to Improve telegraphic transmission affected by the complexity of the communication process because:

**TELEGRAPHIC TRANSMISSION SYSTEM** Has More Heaviness, value, cost, or restriction, whether physical or figurative interacting with S2

**TELEGRAPHIC TRANSMISSION SYSTEM** Has Less Speed or rate of change interacting with S2

**TELEGRAPHIC TRANSMISSION SYSTEM** Has Less Adaptability or versatility to interaction variability of S2

There are undesirable effects that cause dissatisfaction because:

There is Less Quality and opportunity in transmission

### **B. DESIRED EFFECT FOR NEED TO SATISFY**

There is More ease to Improve telegraphic transmission affected by the complexity of the communication process because:

**TELEGRAPHIC TRANSMISSION SYSTEM** Has More Desired ease of change, repair or maintenance to interact with S2

There is desirable effect for need to satisfy because:

There is More Quality and opportunity in transmission

**Table I. RELATIONSHIP WITH UNIVERSAL TRIZ INNOVATION PARAMETERS ( maximum of 7 undesirable effects)**

**CHALLENGE:** Improve telegraphic transmission affected by the complexity of the communication process

This table presents the selected innovation parameters to evaluate the challenge that must be resolved for the interaction between an Object S1 and an Object S2, and no others. The choice of undesirable effects must be based on a thorough review of the current situation, identifying them based on the objective evidence present within the predefined space and time of evaluation. Fulfilling this requirement is crucial: If you do not connect the dots of the current situation properly, the algorithm will deliver a disconnected solution.

The selection of the need to satisfy should reflect the best estimation of the innovation-evolution state of the object S1 being evaluated.

Recognizing the criticality of this selection process, the Aatrizinventor algorithm provides flexibility to change parameters and conducts a sensitivity analysis in order to offer alternative solutions. These alternatives are based on different combinations of the entered parameters, also including a different need to satisfy from the one originally posed.

<b>Parameters to evaluate(s)</b>	<b>It is understood as TELEGRAPHIC TRANSMISSION SYSTEM has:</b>
<b>Parámetros of undesirable effects (UDE):</b>	<b>Undesirable effects causes of dissatisfaction:</b>
(+) 2. Heaviness of stationary object	More Heaviness, value, cost, or restriction, whether physical or figurative interacting with S2
(-) 9. Speed	Less Speed or rate of change interacting with S2
(-) 35. Adaptability or versatility	Less Adaptability or versatility to interaction variability of S2
n/a	
<b>Desirable parameter (DE):</b>	<b>Desirable Effect for Need to satisfy:</b>
(+) 34. Ease of change, repair or maintain	More Desired ease of change, repair or maintenance to interact with S2
<b>TRIZ undesirables parameters for sensitivity analysis</b>	<b>It is understood as TELEGRAPHIC TRANSMISSION SYSTEM has:</b>
(-) 12. Shape / composition / configuration	Less Appropriate shape, composition, or configuration interacting with S2
(+) 36. Complexity of Device/ Action	More Complexity of equipment or action interacting with S2
n/a	
n/a	
n/a	

## EVALUTION RESULTS TABLES

**TABLE II. SPECIFIC CONTRADICTION MATRIX FOR UNDESIRABLE EFFECTS AND NEED TO SATISFY. FOR EVALUATED OBJECT: TELEGRAPHIC TRANSMISSION SYSTEM AND NEED TO BE SATISFIED >**

### 34. Ease of change, repair or maintain

CHALLENGE: Improve telegraphic transmission affected by the complexity of the communication process

(\*) Preferred parameters: Improve 9. Speed & Attenuate or preserve 34. Ease of change, repair or maintain.

Contradictions/ E.C: Essential, Comp.:Complementary, Top 5: Up to the major fifth, noted if outside the preferred parameters.

Parameters in the first row are the same as those in the first column.

Parameter to attenuate or preserve => Parameter to improve	Var.	(+) Par.2	(-) Par.9	(-) Par.35	Par.0	(+) Par.34 PREF.	Sum wt
(+) 2. Heaviness of stationary object	wt		-	<b>wt.4 Top 5</b>	-	<b>wt.8 Compl.</b>	39%
	IP(s)	0,0,0,0	0,0,0,0	19,15,29,0	0,0,0,0	2,27,28,11	
(-) 9. Speed PREF.	wt	-		<b>wt.9 Compl.</b>	-	<b>wt.1 E.C.</b>	76%
	IP(s)	0,0,0,0	0,0,0,0	15,10,26,0	0,0,0,0	34,2,28,27	
(-) 35. Adaptability or versatility	wt	<b>wt.2 Top 5</b>	wt.10		-	<b>wt.5 Compl.</b>	71%
	IP(s)	19,15,29,16	35,10,14,0	0,0,0,0	0,0,0,0	1,16,7,4	
n/a	wt	-	-	-		-	0%
	IP(s)	0,0,0,0	0,0,0,0	0,0,0,0	0,0,0,0	0,0,0,0	
(+) 34. Ease of change, repair or maintain	wt	<b>wt.3 Top 5</b>	wt.7	wt.6	-		63%
	IP(s)	2,27,35,11	34,9,0,0	7,1,4,16	0,0,0,0	0,0,0,0	
Sum wt		64%	26%	59%	0%	100%	

This table shows the essential contradiction (E.C.) that determines the solution strategy. Additionally, preferred parameters are established where complementary contradictions (Compl.) are found, allowing the definition of the Base Solution shown in Table III.

As a complement to the Base Solution, Table II also provides the following information that could be relevant to obtain an optimal solution:

- The algorithm identifies the top 5 contradictions from the entire Table II and highlights those that are outside the preferred parameters for further review.
- There are inventive principles present in Table II that are not part of the Recommended Solution

proposed in Table V. In the latter, the top three most relevant ones are highlighted, and the contradictions they involve are presented to evaluate whether they contribute significant aspects to the desired solution. For further details, Table VIII provides a prioritization of the inventive principles from Table II, and those not included in the Recommended Solution in Table V are marked with \*\*\*.

**TABLE III. BASE SOLUTION FOR THE EVALUATED OBJECT: TELEGRAPHIC TRANSMISSION SYSTEM  
NEED TO SATISFY > 34. Ease of change, repair or maintain**

CHALLENGE: Improve telegraphic transmission affected by the complexity of the communication process

Table II Selection: Essential Contradiction wt.1 y Complementary contradictions with preferred parameters (*) wt.5/wt.8/wt.9/							
Parameter to improve	Parameter to attenuate or preserve	Contradict.	Wt.n	IP. Ord.1	IP Ord 2	IP Ord 3	IP Ord 4
(-) 9. Speed	(+) 34. Ease of change, repair or maintain	Essential	wt.1	<b>34 Es.</b>	<b>2 Es.</b>	<b>28 Es.</b>	<b>27 Es.</b>
(-) 35. Adaptability or versatility	(+) 34. Ease of change, repair or maintain	Compl. 1	wt.5	1	16	7	4
(+) 2. Heaviness of stationary object	(+) 34. Ease of change, repair or maintain	Compl. 2	wt.8	<b>2 Es.</b>	<b>27 Es.</b>	<b>28 Es.</b>	11
(-) 9. Speed	(-) 35. Adaptability or versatility	Compl. 3	wt.9	15	10	26	0
n/a	n/a	Compl. 4		0	0	0	0

#### Inventive Principles (IP) selected for the Base Solution

IP.34. Discarding and Recovering - tactical type

IP.2. Taking out/ Adding - strategic type

IP.28. Mechanics Substitution - strategic type

IP.27. Cheap Short-Living Objects - strategic type

IP.1. Segmenting/ Integrating - strategic type

IP.16. Partial or Excessive Actions - **operative type**

IP.7. Nesting/ Dispersing - tactical type

IP.4. Asymmetry/ Symmetry - **operative type**

IP.11. Beforehand Cushioning - tactical type

IP.15. Dynamics - strategic type

IP.10. Preliminary Action - strategic type

IP.26. Copying/ Replicating - strategic type

Table III shows the essential contradiction, the one with the highest weight, plus the following 4 complementary contradictions in weight, which are located in the row and column of the preferred parameters selected in Table II. These contradictions are considered relevant for the solution and are described as the Base Solution in Table IX.

Keep in mind that all inventive principles selected for a solution must be evaluated according to the specific context of the contradictions in which they participate.

Inventive principles marked with 'Es.' correspond to inventive principles that belong to the essential contradiction.

**TABLE IV. CONTRADICTION MATRIX COVERAGE FOR SOLUTION AMONG NEEDS TO SATISFY FOR EVALUATED OBJECT: TELEGRAPHIC TRANSMISSION SYSTEM, NEED TO BE SATISFY: 34. Ease of change, repair or maintain**

Coverage is defined as the extent to which the inventive principles from Table II encompass the inventive principles from Table IV. If weighted coverage is higher, it has been observed that the obtained solution is more likely to have the lowest cost and the maximum benefit-to-cost ratio.

Parameter to improve	Parameter to preserve	IP. Ord.1	IP Ord 2	IP Ord 3	IP Ord 4
34. Ease of change, repair or maintain	33. Ease of operation	1	<b>12</b> nT2	26	15
34. Ease of change, repair or maintain	39. Productivity	1	<b>32</b> nT2	10	0
34. Ease of change, repair or maintain	38. Extent of automation/ autonomy	34	35	7	<b>13</b> nT2
34. Ease of change, repair or maintain	34. Ease of change, repair or maintain	0	0	0	0
34. Ease of change, repair or maintain	32. Ease of achieving desired outcome	1	35	11	10
34. Ease of change, repair or maintain	20. Use of energy by stationary object	0	0	0	0
34. Ease of change, repair or maintain	27. Reliability	11	10	1	16
34. Ease of change, repair or maintain	35. Adaptability or versatility	7	1	4	16
34. Ease of change, repair or maintain	13. Stability	2	35	0	0
34. Ease of change, repair or maintain	16. Duration of action by stationary object	1	0	0	0

**Inventive Principles (IP) selected for the Solution of relevant Contradictions between Needs to Satisfy**

IP.1. Segmenting/ Integrating - strategic tpe

IP.12. Equipotentiality - tactical type

IP.26. Copying/ Replicating - strategic tpe

- IP.15. Dynamics - strategic tpe
- IP.32. Perception/ Appearance/ Color Changes - strategic tpe
- IP.10. Preliminary Action - strategic tpe
- IP.34. Discarding and Recovering - tactical type
- IP.35. Transformation / Parameter Changes - strategic tpe
- IP.7. Nesting/ Dispersing - tactical type
- IP.13. Reverse or Indirect Action - strategic tpe

93.69 % weighted coverage of the inventive principles (IP) included in Table IV. of Contradictions between Needs to Satisfy (NS), in relation to the IP included in Table II Specific Contradiction Matrix.

The inventive principles labeled with nT2 are not found in Table II. Due to this condition, the first three contradictions in Table IV containing principles marked with nT2 are described as a Solution among Needs to Satisfy in Table IX. This solution, combined with the previously mentioned Base Solution, forms the Recommended Solution by the Aatrizinventor Algorithm, shown in Table V.

**From practical experience, if Table IV contains more than 3 contradictions with inventive principles not included in Table II, then it is likely to be more challenging to construct a specific solution. In that case, it is recommended to look for an alternative combination of parameters in Table VI of sensitivity analysis. It is also an option to select another need to satisfy, which is shown in Table VII Essential Contradictions of Needs to Satisfy (NS) for the same undesirable effects already evaluated for TELEGRAPHIC TRANSMISSION SYSTEM.**

To evaluate the recommended inventive principles here and the corresponding contradictions in which they participate, it is necessary for the Base Solution to guide an initial context for the solution, as the contradictions between Needs to Satisfy do not identify which variable of the evaluated object S1 should be operated.

Inventive principles labeled with nT3 are included in Table II, but do not participate in the Recommended Solution shown in Table V. The Innovation Team must review the contradictions where they participate, to determine if there were other specific aspects that could be significant for the solution.

Unmarked inventive principles are included in Table II Specific Contradiction Matrix and in Table V Recommended Solution.

**TABLE V. RECOMMENDED SOLUTION FOR INNOVATION CHALLENGE FOR EVALUATED OBJECT TELEGRAPHIC TRANSMISSION SYSTEM**

CHALLENGE: Improve telegraphic transmission affected by the complexity of the communication process  
 Evaluated need to satisfy in this report: **34. Ease of change, repair or maintain**

UDEs: (+) 2. Heaviness of stationary object// (-) 9. Speed// (-) 35. Adaptability or versatility// n/a

Parameter to improve	Parameter to attenuate or preserve	Contradict.	Wt.n	IP. Ord.1	IP Ord 2	IP Ord 3	IP Ord 4
(-) 9. Speed	(+) 34. Ease of change, repair or maintain	Essential	wt.1	<b>34 Es.</b>	<b>2 Es.</b>	<b>28 Es.</b>	<b>27 Es.</b>
(-) 35. Adaptability or versatility	(+) 34. Ease of change, repair or maintain	Compl. 1	wt.5	1	16	7	4

(+) 2. Heaviness of stationary object	(+) 34. Ease of change, repair or maintain	Compl. 2	wt.8	<b>2 Es.</b>	<b>27 Es.</b>	<b>28 Es.</b>	11
(-) 9. Speed	(-) 35. Adaptability or versatility	Compl. 3	wt.9	15	10	26	0
n/a	n/a	Compl. 4		0	0	0	0
34. Ease of change, repair or maintain	33. Ease of operation	NS.1	wns.1	1	12	26	15
34. Ease of change, repair or maintain	39. Productivity	NS.2	wns.2	1	32	10	0
34. Ease of change, repair or maintain	38. Extent of automation/ autonomy	NS.3	wns.3	<b>34 Es.</b>	35	7	13

### Relevant inventive principles from Table II not included in Recommended Solution

Before deciding on the solution, make sure you have previously reviewed the contradictions with relevant Inventive Principles from Table II, not included in the Recommended Solution. The 3 most relevant are shown below.

IP.19. Time-Varying Action/ Periodic or Pulsating (Pos.3) ***	IP. Str.	[Par.35][Par.2][ IP(s) : 19,15,29,16] - [Par.2] [Par.35][ IP(s) : 19,15,29,0] -
IP.9. Preliminary Anti-action (Pos.11) ***	IP. Oper.	[Par.34][Par.9][ IP(s) : 34,9,0,0] -
IP.29. Controllable Soft Variables (Pos.12) ***	IP. Tac.	[Par.35][Par.2][ IP(s) : 19,15,29,16] - [Par.2] [Par.35][ IP(s) : 19,15,29,0] -

### Inventive Principles (IP) selected for Recommended Solution:

To develop a Specific Solution based on the contradictions provided in Table V, where S1: TELEGRAPHIC TRANSMISSION SYSTEM interacts with S2: SENDER'S MESSAGE, the Innovation Team must analyze the recommended innovation concepts for each selected inventive principle listed below. At least one concept from each principle that is applicable to the challenge under evaluation should be chosen.

Once the concepts are selected per inventive principle, it is essential to conduct an 'integrated reading' of the contradictions indicated in Table V. If this 'integrated reading' can demonstrate a coherent logical thread for each selected contradiction and as a whole, then it can be considered that there is a potential innovation solution.

To complete the definition of the specific solution, it is necessary to review the relevant inventive principles from Table II that were not included in the Recommended Solution in Table V, which are presented above.

For more details on the selected contradictions, you can review the complete descriptions of the inventive principles by contradiction, as shown in Table IX.

In the Starting Manual, Fundamentals of Aatrizinventor, Point 11, an example is provided for developing the Specific Solution based on the Recommended Solution by the Aatrizinventor algorithm, based on the 'Language of Nature Innovation.' The identification of a specific solution is a systematic and iterative process involving multiple concepts, aiming to determine a comprehensive solution with minimal implementation costs and maximum benefit-to-cost ratio.

It's important noting that an asterisk (\*) has been added to the name of the object under evaluation to remind that the descriptions of the inventive principles may consider that TELEGRAPHIC TRANSMISSION SYSTEM can be in its current physical and functional state, or in a modified state, or even in a new state, as needed to achieve the desired objective. Please, make the most of your relational thinking skills.

**Summary description of the Inventive Principles included in the Recommended Solution shown above, applicable to the challenge under evaluation for the defined space and time:**

**N°1 Improve: (-) 9. Speed and Attenuate or Preserve: (+) 34. Ease of change, repair or maintain**

**IP.34. Discarding and Recovering - tactical type (1)**

- a. Make portions of TELEGRAPHIC TRANSMISSION SYSTEM\*, which have fulfilled their functions or are unnecessary, go away (discard by absorption, dissolving, evaporating, etc.).
- b. Conversely, restore consumable parts of TELEGRAPHIC TRANSMISSION SYSTEM\* directly in operation.

**IP.2. Taking out/ Adding - strategic type (2)**

- a. Separate an interfering part or a property from TELEGRAPHIC TRANSMISSION SYSTEM\*, or single out the only necessary part (or property) of TELEGRAPHIC TRANSMISSION SYSTEM\*.
- b. Add new parts or properties to TELEGRAPHIC TRANSMISSION SYSTEM\*.

**IP.28. Mechanics Substitution - strategic type (3)**

- a. Replace a direct or manual action in, or for, TELEGRAPHIC TRANSMISSION SYSTEM\*, with a mechanical action or a tool.
- b. Replace a mechanical means in, or for, TELEGRAPHIC TRANSMISSION SYSTEM\*, with sensory (optical, acoustic, vibration, taste, smell, feelings or other sensory fields) means.
- c. Use mechanical, pneumatic, hydraulic, electric, magnetic, and electromagnetic, chemical, biological, psychological or other fields to improve action of TELEGRAPHIC TRANSMISSION SYSTEM\*.
- d. Change from static fields in, or for, TELEGRAPHIC TRANSMISSION SYSTEM\* to moving fields, from unstructured fields to those with structure, or vice versa.
- e. Use fields in conjunction with field-activated parts, components, or particles (e.g., magnetic field and ferromagnetic particles) in, or for, TELEGRAPHIC TRANSMISSION SYSTEM\*.

**IP.27. Cheap Short-Living Objects - strategic type (4)**

- a. Replace or divide (either fully or partially) TELEGRAPHIC TRANSMISSION SYSTEM\* or its action with multiple inexpensive or short-living objects, actions, or sub-parts, which compress or simplify its characteristics and properties, and/or are limited but sufficient to achieve the desired objective.
- b. Compress certain qualities of TELEGRAPHIC TRANSMISSION SYSTEM\* (e.g., the degree of participation, complexity, or lifetime), with no loss of functionality, to achieve the desired objective.

**N°2 Improve: (-) 35. Adaptability or versatility and Attenuate or Preserve: (+) 34. Ease of change, repair or maintain**

**IP.1. Segmenting/ Integrating - strategic type (5)**

- a. Divide TELEGRAPHIC TRANSMISSION SYSTEM\* into existing and/or new parts, shapes, phases, states, or conditions.
- b. Integrate different existing or new parts, forms, phases, states or conditions of TELEGRAPHIC TRANSMISSION SYSTEM\* in a single entity.
- c. Make TELEGRAPHIC TRANSMISSION SYSTEM\* easy to disassemble or assemble.
- d. Increase or reduce the degree of fragmentation or segmentation of TELEGRAPHIC TRANSMISSION SYSTEM\*.

**IP.16. Partial or Excessive Actions - operative type (6)**

- a. If the objective of TELEGRAPHIC TRANSMISSION SYSTEM\* in its interaction with SENDER'S MESSAGE is difficult to fully achieve using a given solution, then use 'a little less' or 'a little more' of the same solution.

**IP.7. Nesting/ Dispersing - tactical type (7)**

- a. Place TELEGRAPHIC TRANSMISSION SYSTEM\* fully or partially inside another object; place each object, in turn, fully or partially inside the other.
- b. Make one part of OBJECT S1 pass through a cavity in the other, or vice versa.
- c. If TELEGRAPHIC TRANSMISSION SYSTEM\* is nested with another object, and if necessary, apply a dispersing action.

**IP.4. Asymmetry/ Symmetry - operative type (8)**

- a. Change the shape of TELEGRAPHIC TRANSMISSION SYSTEM\* from symmetrical to asymmetrical, permanent, or variable in time, or vice versa.
- b. If TELEGRAPHIC TRANSMISSION SYSTEM\* is asymmetrical, increase its degree of asymmetry, or vice versa.

**N°3 Improve: (+) 2. Heaviness of stationary object and Attenuate or Preserve: (+) 34. Ease of change, repair or maintain**

**IP.2. Taking out/ Adding - strategic type (9)**

- a. Separate an interfering part or a property from TELEGRAPHIC TRANSMISSION SYSTEM\*, or single out the only necessary part (or property) of TELEGRAPHIC TRANSMISSION SYSTEM\*.
- b. Add new parts or properties to TELEGRAPHIC TRANSMISSION SYSTEM\*.

**IP.27. Cheap Short-Living Objects - strategic type (10)**

- a. Replace or divide (either fully or partially) TELEGRAPHIC TRANSMISSION SYSTEM\* or its action with multiple inexpensive or short-living objects, actions, or sub-parts, which compress or simplify its characteristics and properties, and/or are limited but sufficient to achieve the desired objective.
- b. Compress certain qualities of TELEGRAPHIC TRANSMISSION SYSTEM\* (e.g., the degree of participation, complexity, or lifetime), with no loss of functionality, to achieve the desired objective.

**IP.28. Mechanics Substitution - strategic type (11)**

- a. Replace a direct or manual action in, or for, TELEGRAPHIC TRANSMISSION SYSTEM\*, with a mechanical action or a tool.
- b. Replace a mechanical means in, or for, TELEGRAPHIC TRANSMISSION SYSTEM\*, with sensory (optical, acoustic, vibration, taste, smell, feelings or other sensory fields) means.
- c. Use mechanical, pneumatic, hydraulic, electric, magnetic, and electromagnetic, chemical, biological, psychological or other fields to improve action of TELEGRAPHIC TRANSMISSION SYSTEM\*.
- d. Change from static fields in, or for, TELEGRAPHIC TRANSMISSION SYSTEM\* to moving fields, from unstructured fields to those with structure, or vice versa.

e. Use fields in conjunction with field-activated parts, components, or particles (e.g., magnetic field and ferromagnetic particles) in, or for, TELEGRAPHIC TRANSMISSION SYSTEM\*.

**IP.11. Beforehand Cushioning - tactical type** (12)

a. Prepare emergency means, beforehand, to compensate for the relatively low reliability of TELEGRAPHIC TRANSMISSION SYSTEM\*.

**N°4 Improve: (-) 9. Speed and Attenuate or Preserve: (-) 35. Adaptability or versatility**

**IP.15. Dynamics - strategic type** (13)

a. Allow (or design) the characteristics of TELEGRAPHIC TRANSMISSION SYSTEM\*, external environment, or process to change to an optimal, or to find an optimal, operating condition.

b. Divide TELEGRAPHIC TRANSMISSION SYSTEM\* into parts that are capable of relative movement between each other.

c. If TELEGRAPHIC TRANSMISSION SYSTEM\* (or process) is rigid or inflexible, make it flexible or adaptive.

d. To enhance the dynamics of TELEGRAPHIC TRANSMISSION SYSTEM\* or the process, use feature(s) or object(s) available in the nearby environment.

**IP.10. Preliminary Action - strategic type** (14)

a. Perform the required change in, or for, TELEGRAPHIC TRANSMISSION SYSTEM\*, before it is needed (either fully or partially).

b. Pre-arrange TELEGRAPHIC TRANSMISSION SYSTEM\* and other objects, if necessary, in such a way that they can come into action from the most convenient place and without losing time for their delivery.

**IP.26. Copying/ Replicating - strategic type** (15)

a. Instead of using TELEGRAPHIC TRANSMISSION SYSTEM\*, or any of its unavailable, expensive, fragile parts or properties, use simpler and inexpensive copies or replicates to perform the desired function and, if possible, do so with improved characteristics and properties, while disregarding the harmful, undesirable, or unnecessary ones.

b. Imitate TELEGRAPHIC TRANSMISSION SYSTEM\*, or any of its parts or properties, leveraging the relevant available environment.

c. If simple copies, or replicates are already being used, apply copies, or replicates of a higher level or technical

**N°5 Improve: n/a and Attenuate or Preserve: n/a**

**N°6 Improve: 34. Ease of change, repair or maintain and Preserve: 33. Ease of operation**

**IP.1. Segmenting/ Integrating - strategic type** (16)

a. Divide TELEGRAPHIC TRANSMISSION SYSTEM\* into existing and/or new parts, shapes, phases, states, or conditions.

b. Integrate different existing or new parts, forms, phases, states or conditions of TELEGRAPHIC TRANSMISSION SYSTEM\* in a single entity.

c. Make TELEGRAPHIC TRANSMISSION SYSTEM\* easy to disassemble or assemble.

d. Increase or reduce the degree of fragmentation or segmentation of TELEGRAPHIC TRANSMISSION SYSTEM\*.

**IP.12. Equipotentiality - tactical type** (17)

a. In a potential field, limit position changes or energy variations of TELEGRAPHIC TRANSMISSION SYSTEM\*.

**b.** Change operating conditions to eliminate the need to change the position or energy quality of TELEGRAPHIC TRANSMISSION SYSTEM\* in a potential field.

**IP.26. Copying/ Replicating - strategic type** (18)

**a.** Instead of using TELEGRAPHIC TRANSMISSION SYSTEM\*, or any of its unavailable, expensive, fragile parts or properties, use simpler and inexpensive copies or replicates to perform the desired function and, if possible, do so with improved characteristics and properties, while disregarding the harmful, undesirable, or unnecessary ones.

**b.** Imitate TELEGRAPHIC TRANSMISSION SYSTEM\*, or any of its parts or properties, leveraging the relevant available environment.

**c.** If simple copies, or replicates are already being used, apply copies, or replicates of a higher level or technical

**IP.15. Dynamics - strategic type** (19)

**a.** Allow (or design) the characteristics of TELEGRAPHIC TRANSMISSION SYSTEM\*, external environment, or process to change to an optimal, or to find an optimal, operating condition.

**b.** Divide TELEGRAPHIC TRANSMISSION SYSTEM\* into parts that are capable of relative movement between each other.

**c.** If TELEGRAPHIC TRANSMISSION SYSTEM\* (or process) is rigid or inflexible, make it flexible or adaptive.

**d.** To enhance the dynamics of TELEGRAPHIC TRANSMISSION SYSTEM\* or the process, use feature(s) or object(s) available in the nearby environment.

**N°7 Improve: 34. Ease of change, repair or maintain and Preserve: 39. Productivity**

**IP.1. Segmenting/ Integrating - strategic type** (20)

**a.** Divide TELEGRAPHIC TRANSMISSION SYSTEM\* into existing and/or new parts, shapes, phases, states, or conditions.

**b.** Integrate different existing or new parts, forms, phases, states or conditions of TELEGRAPHIC TRANSMISSION SYSTEM\* in a single entity.

**c.** Make TELEGRAPHIC TRANSMISSION SYSTEM\* easy to disassemble or assemble.

**d.** Increase or reduce the degree of fragmentation or segmentation of TELEGRAPHIC TRANSMISSION SYSTEM\*.

**IP.32. Perception/ Appearance/ Color Changes - strategic type** (21)

**a.** Change how is perceived, the appearance or shape of TELEGRAPHIC TRANSMISSION SYSTEM\* in relation to the object S2 with which it interacts.

**b.** Change the color, or appearance, of TELEGRAPHIC TRANSMISSION SYSTEM\* or its external environment.

**c.** Change the transparency of TELEGRAPHIC TRANSMISSION SYSTEM\* or its external environment.

**IP.10. Preliminary Action - strategic type** (22)

**a.** Perform the required change in, or for, TELEGRAPHIC TRANSMISSION SYSTEM\*, before it is needed (either fully or partially).

**b.** Pre-arrange TELEGRAPHIC TRANSMISSION SYSTEM\* and other objects, if necessary, in such a way that they can come into action from the most convenient place and without losing time for their delivery.

**N°8 Improve: 34. Ease of change, repair or maintain and Preserve: 38. Extent of automation/ autonomy**

**IP.34. Discarding and Recovering - tactical type** (23)

**a.** Make portions of TELEGRAPHIC TRANSMISSION SYSTEM\*, which have fulfilled their functions or are

unnecessary, go away (discard by absorption, dissolving, evaporating, etc.).

b. Conversely, restore consumable parts of TELEGRAPHIC TRANSMISSION SYSTEM\* directly in operation.

**IP.35. Transformation / Parameter Changes - strategic type** (24)

a. Change TELEGRAPHIC TRANSMISSION SYSTEM\*'s physical or chemical state (e.g., in shape, in composition, to a gas, liquid, solid or plasma).

b. Change the composition or condition of TELEGRAPHIC TRANSMISSION SYSTEM\* by adding or removing components.

c. Change the concentration or consistency; change the degree of flexibility; change the temperature or the level of internal activity of TELEGRAPHIC TRANSMISSION SYSTEM\*.

**IP.7. Nesting/ Dispersing - tactical type** (25)

a. Place TELEGRAPHIC TRANSMISSION SYSTEM\* fully or partially inside another object; place each object, in turn, fully or partially inside the other.

b. Make one part of OBJECT S1 pass through a cavity in the other, or vice versa.

c. If TELEGRAPHIC TRANSMISSION SYSTEM\* is nested with another object, and if necessary, apply a dispersing action.

**IP.13. Reverse or Indirect Action - strategic type** (26)

a. Inverse the applied action or apply an indirect action to perform the current function of TELEGRAPHIC TRANSMISSION SYSTEM\* to interact with object S2 It should be identified how TELEGRAPHIC TRANSMISSION SYSTEM\* currently performs an action with Object S2 and from there evaluate an inverse or indirect action.

b. Make moving parts of TELEGRAPHIC TRANSMISSION SYSTEM\* (or the external environment) fixed, and fixed parts moving.

c. Turn TELEGRAPHIC TRANSMISSION SYSTEM\* (or process) 'upside down', 'change the position', 'change the condition'.

**Relevant inventive principles from Table II not included in Recommended Solution**

**IP.19. Time-Varying Action/ Periodic or Pulsating (Pos.(3) - strategic type** (27)

a. Instead of using continuous action in, or for, TELEGRAPHIC TRANSMISSION SYSTEM\*, use time-varying, periodic, or pulsating actions.

b. If the action of TELEGRAPHIC TRANSMISSION SYSTEM\* is already periodic, change the periodic magnitude or frequency.

c. Use pauses between impulses to perform a different action of TELEGRAPHIC TRANSMISSION SYSTEM\*.

d. If the current action of TELEGRAPHIC TRANSMISSION SYSTEM\* is time-varying, and if necessary, change to an action higher or lesser time-varying.

**(Pos.())** (28)

**IP.29. Controllable Soft Variables (Pos.(12) - tactical type** (29)

a. Use external, controllable soft variables (manual, physical, mechanical, pneumatic, hydraulic, electrical, magnetic, electromagnetic, digital, chemical, biological, social, psychological, physiological, etc.) to interact with TELEGRAPHIC TRANSMISSION SYSTEM\* facilitating goal fulfillment of the function performed with Object S2.

b. Make easier TELEGRAPHIC TRANSMISSION SYSTEM\* interact with Object S2 using internal, controllable soft variables (manual, physical, mechanical, pneumatic, hydraulic, electrical, magnetic,

electromagnetic, digital, chemical, biological, social, psychological, physiological , etc.) available in S1 and / or S2, facilitating goal fulfillment.

**TABLE VI. RESULTS OF SENSITIVITY ANALYSIS FOR THE EVALUATED OBJECT TELEGRAPHIC TRANSMISSION SYSTEM**

CHALLENGE: Improve telegraphic transmission affected by the complexity of the communication process

Coverage obtained for the current evaluation to compare with sensitivity analysis

Order	Par.1	Par.2	Par.3	Par.4	Par.5	Cob. NS (%)	Cob. EC (%)	Cob. GL (%)
#	2	9	35	0	34. Ease of change, repair or maintain	93.69	49.94	82.76

Table VI presents the 10 most favorable parameter combinations recommended by the Aatrizinventor algorithm. It is suggested to evaluate the 2 or 3 most relevant ones. Practice teaches that they often contain the best solution for the evaluated challenge.

Combination of TRIZ innovation parameters evaluated in this Aatrizinventor Solution is not prioritized here

**A. PRIORITISED CONTRADICTIONS BY GLOBAL COVERAGE (Cob.GL)**

Par.5 is automatically selected

Order	Par.1	Par.2	Par.3	Par.4	Par.5	Cob. NS (%)	Cob. EC (%)	Cob. GL (%)
I.a	2	12	35	36	33. Ease of operation	95.21	100	96.41
II.a	2	9	35	36	34. Ease of change, repair or maintain	94.59	100	95.94
III.a	2	9	36	0	20. Use of energy by stationary object	91.5	96.67	92.79
IV.a	9	12	35	36	32. Ease of achieving desired outcome	87.58	100	90.68
V.a	2	12	35	36	34. Ease of change, repair or maintain	86.86	100	90.14

**B. PRIORITIZATION OF CONTRADICTIONS BY COVERAGE OF NEEDS TO SATISFY (Cob.NS)**

Par.5 is automatically selected

Order	Par.1	Par.2	Par.3	Par.4	Par.5	Cob. NS (%)	Cob. EC (%)	Cob. GL (%)	Table VI.A
I.b	2	12	35	36	33. Ease of operation	95.21	100	96.41	I.a
II.b	2	9	35	36	34. Ease of change, repair or maintain	94.59	100	95.94	II.a
III.b	9	12	35	36	34. Ease of change, repair or maintain	94.59	42.28	81.51	-
IV.b	9	35	36	0	34. Ease of change, repair or maintain	94.59	21.54	76.33	-
V.b	2	9	12	35	34. Ease of change, repair or maintain	94.59	20.04	75.95	-

**TABLE VII ESSENTIAL CONTRADICTIONS MATRIX FOR NEEDS TO SATISFY (NS) FOR THE SAME UNDESIRABLE EFFECTS EVALUATED OF: TELEGRAPHIC TRANSMISSION SYSTEM**

CHALLENGE: Improve telegraphic transmission affected by the complexity of the communication process

Evaluated need to satisfy in this report: **34. Ease of change, repair or maintain**

UDEs: (+) 2. Heaviness of stationary object// (-) 9. Speed// (-) 35. Adaptability or versatility// n/a

This table allows the Innovation Team to compare the coverages obtained for the evaluated need to satisfy with those of the other defined needs, for the same undesirable effects. This way, they can decide whether to choose any of the suggested innovation parameter combinations here that offer better coverage.

Need to Satisfy	Parameter to improve	Parameter to attenuate or preserve	Contradict. Essential	Cob. NS (%)	Cob. between EC (%)	Cob. GL (%) 3/1
<b>34. Ease of change, repair or maintain</b>	(-) 9. Speed	(+) 34. Ease of change, repair or maintain	[34,2,28,27]	93.69	49.94	82.76
39. Productivity	(+) 2. Heaviness of stationary object	(+) 39. Productivity	[1,28,15,35]	73.4	100	80.05
32. Ease of achieving desired outcome	(+) 32. Ease of achieving desired outcome	(-) 9. Speed	[35,13,8,1]	85.8	23.37	70.2
20. Use of energy by stationary object	(+) 2. Heaviness of stationary object	(-) 35. Adaptability or versatility	[19,15,29,0]	83.99	21.68	68.41
33. Ease of operation	(+) 2. Heaviness of stationary object	(+) 33. Ease of operation	[6,13,1,32]	75.5	15.64	60.54

38. Extent of automation/ autonomy	(+) 38. Extent of automation/ autonomy	(+) 2. Heaviness of stationary object	[28,26,35,10]	72.12	15.23	57.9
13. Stability	(+) 13. Stability	(-) 9. Speed	[33,15,28,18]	67.82	19.31	55.7
27. Reliability	(+) 27. Reliability	(-) 9. Speed	[21,35,11,28]	55.22	30.8	49.11
16. Duration of action by stationary object	(+) 2. Heaviness of stationary object	(+) 16. Duration of action by stationary object	[2,27,19,6]	42.68	59.52	46.89
35. Adaptability or versatility	(+) 35. Adaptability or versatility	(+) 2. Heaviness of stationary object	[19,15,29,16]	45.03	13.1	37.05

Table VII shows the essential contradictions obtained for each of the defined Needs to Satisfy, taking into account the same undesirable effects that have been evaluated. This table is based on the calculation of a global coverage (Cob.GL), which is determined by combining two values: the coverage from Table IV (Cob.NS) already explained, and a relative coverage (Cob. between EC) that is obtained in this table VII, when each other comparing the essential contradictions identified for the 10 parameters of Needs to Satisfy.

This global coverage (GL) is based on expert weighting criteria to prioritize the solutions for the different Needs to Satisfy. Experience with aatrizinventor indicates that the most effective solutions are those with higher global coverage, preferably exceeding 90%, if possible.

**The Innovation Team may decide if it is appropriate to carry out a new evaluation with another Need to Satisfy, selected from the results provided in Table VII. This decision will be primarily made when the evaluated Need to Satisfy is not ranked in the first position of Table VII. In this table, the position of the evaluated Need to Satisfy is highlighted: 34. Ease of change, repair or maintain.**

#### TABLE VIII. ORDER OF INCIDENCE OF INVENTIVE PRINCIPLES (POS.n)

CHALLENGE: Improve telegraphic transmission affected by the complexity of the communication process  
Participation analysis of inventive principles in TABLE II SPECIFIC CONTRADICTION MATRIX.

Evaluated parameters for Object TELEGRAPHIC TRANSMISSION SYSTEM:

Par. UDEs:

(+) 2. Heaviness of stationary object

(-) 9. Speed

(-) 35. Adaptability or versatility

n/a

Par. NS: (+) 34. Ease of change, repair or maintain

\*\*\*: Inventive Principles from the Specific Contradiction Matrix (Table II) not described in the Recommend Solution (Table IX). It is recommended to perform an additional review following the order of position.

Inventive principles of Table II	IP type	Tables	Contradictions
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IP.2. Taking out/ Adding (Pos.1)	IP. Str.	II / III / IV	[Par.34][Par.2][ IP(s) : 2,27,35,11] - [Par.2][Par.34][ IP(s) : 2,27,28,11] - [Par.9][Par.34][ IP(s) : 34,2,28,27] -
IP.34. Discarding and Recovering (Pos.2)	IP. Tac.	II / III / IV	[Par.34][Par.9][ IP(s) : 34,9,0,0] - [Par.9][Par.34][ IP(s) : 34,2,28,27] -
IP.19. Time-Varying Action/ Periodic or Pulsating (Pos.3) ***	IP. Str.	II /	[Par.35][Par.2][ IP(s) : 19,15,29,16] - [Par.2][Par.35][ IP(s) : 19,15,29,0] -
IP.15. Dynamics (Pos.4)	IP. Str.	II / III / IV	[Par.35][Par.2][ IP(s) : 19,15,29,16] - [Par.2][Par.35][ IP(s) : 19,15,29,0] - [Par.9][Par.35][ IP(s) : 15,10,26,0] -
IP.1. Segmenting/ Integrating (Pos.5)	IP. Str.	II / III / IV	[Par.34][Par.35][ IP(s) : 7,1,4,16] - [Par.35][Par.34][ IP(s) : 1,16,7,4] -
IP.35. Transformation / Parameter Changes (Pos.6)	IP. Str.	II / IV	[Par.34][Par.2][ IP(s) : 2,27,35,11] - [Par.35][Par.9][ IP(s) : 35,10,14,0] -
IP.7. Nesting/ Dispersing (Pos.7)	IP. Tac.	II / III / IV	[Par.34][Par.35][ IP(s) : 7,1,4,16] - [Par.35][Par.34][ IP(s) : 1,16,7,4] -
IP.27. Cheap Short-Living Objects (Pos.8)	IP. Str.	II / III / IV	[Par.34][Par.2][ IP(s) : 2,27,35,11] - [Par.2][Par.34][ IP(s) : 2,27,28,11] - [Par.9][Par.34][ IP(s) : 34,2,28,27] -
IP.10. Preliminary Action (Pos.9)	IP. Str.	II / III / IV	[Par.35][Par.9][ IP(s) : 35,10,14,0] - [Par.9][Par.35][ IP(s) : 15,10,26,0] -
IP.16. Partial or Excessive Actions (Pos.10)	<b>IP. Oper.</b>	II / III / IV	[Par.35][Par.2][ IP(s) : 19,15,29,16] - [Par.34][Par.35][ IP(s) : 7,1,4,16] - [Par.35][Par.34][ IP(s) : 1,16,7,4] -
IP.9. Preliminary Anti-action (Pos.11) ***	<b>IP. Oper.</b>	II /	[Par.34][Par.9][ IP(s) : 34,9,0,0] -
IP.29. Controllable Soft Variables (Pos.12) ***	IP. Tac.	II /	[Par.35][Par.2][ IP(s) : 19,15,29,16] - [Par.2][Par.35][ IP(s) : 19,15,29,0] -
IP.28. Mechanics Substitution (Pos.13)	IP. Str.	II / III / IV	[Par.2][Par.34][ IP(s) : 2,27,28,11] - [Par.9][Par.34][ IP(s) : 34,2,28,27] -
IP.4. Asymmetry/ Symmetry (Pos.14)	<b>IP. Oper.</b>	II / III / IV	[Par.34][Par.35][ IP(s) : 7,1,4,16] - [Par.35][Par.34][ IP(s) : 1,16,7,4] -
IP.26. Copying/ Replicating (Pos.15)	IP. Str.	II / III / IV	[Par.9][Par.35][ IP(s) : 15,10,26,0] -
IP.14. Spheroidality - Curvature - Angle (Pos.16) ***	IP. Tac.	II /	[Par.35][Par.9][ IP(s) : 35,10,14,0] -

IP.11. Beforehand Cushioning (Pos.17)	IP. Tac.	II / III / IV	[Par.34][Par.2][ IP(s) : 2,27,35,11] - [Par.2][Par.34][ IP(s) : 2,27,28,11] -
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**TABLE IX. RECOMMENDED SOLUTION ACCORDING TO THE MOST RELEVANT CONTRADICTIONS IDENTIFIED FOR THE EVALUATED OBJECT: TELEGRAPHIC TRANSMISSION SYSTEM**

CHALLENGE: Improve telegraphic transmission affected by the complexity of the communication process

This table displays the relevant contradictions identified by the algorithm, which are crucial for determining the direction and scope of the solution to the innovation challenge under evaluation. The specific solution will be obtained by applying the updated inventive principles detailed below.

It is essential to bear in mind that we are evaluating TELEGRAPHIC TRANSMISSION SYSTEM when it interacts with SENDER'S MESSAGE and there is an affected function: telegraphic transmission affected by the complexity of the communication process, in a specific space and time. TELEGRAPHIC TRANSMISSION SYSTEM may require changes in space, time, its physical composition, or its functional characteristic, as well as partial or total replacement with another object or other recommended changes. To emphasize this concept, we mark TELEGRAPHIC TRANSMISSION SYSTEM with an asterisk. Do not read the name of the evaluated object literally; associate it with a possible solution for TELEGRAPHIC TRANSMISSION SYSTEM\*.

Each inventive principle described here may contain more than one innovation concept recommended by TRIZ, identified as a, b, c, ..., not all of which are applicable to a specific case under evaluation. The Innovation Team must select those innovation concepts that best relate to the evaluated innovation challenge, based on their own knowledge and the analysis of relational thinking that they must carry out.

Additionally, technological research may be necessary for its solution, as the specific solution recommended by the inventive principles described here likely already exists somewhere in the world. The interpretation of the inventive principles, to apply them specifically to the evaluated case, is a recursive process that generally ranges from strategic to tactical and operational levels. We recommend completing the reading of the inventive principles described below to envision a possible solution and then rereading the principles to reinforce the coherence of the emerging solution. As a result of the finally determined innovation solution, there will be a change in TELEGRAPHIC TRANSMISSION SYSTEM, in a new context guided by the inventive principles, probably not previously imagined.

The Language of Nature's Innovation provides speed and focus for guided and systematic innovation thinking for individuals. The foundation for innovation is a profound understanding of the current situation.

**IX.A BASE SOLUTION FOR INNOVATION CHALLENGE FOR THE EVALUATED OBJECT TELEGRAPHIC TRANSMISSION SYSTEM NEED TO SATISFY: 34. Ease of change, repair or maintain**

Strategic inventive principles: Str. IP

Tactical inventive principles: Tac. IP

Operative inventive principles: Oper. IP

Pos.n : Order of importance n of an inventive principle included in Table II.

## **ESSENTIAL CONTRADICTION**

### **Contradiction order wt.1**

#### **Parameter to improve: (-) 9. Speed**

TO IMPROVE (UDE): TELEGRAPHIC TRANSMISSION SYSTEM has Less Speed or rate of change interacting with S2

#### **Parameter to attenuate or preserve: (+) 34. Ease of change, repair or maintain**

TO PRESERVE (DE): TELEGRAPHIC TRANSMISSION SYSTEM has More Desired ease of change, repair or maintenance to interact with S2

#### **Inventive principles IP(s) : [34,2,28,27]**

#### **34. Discarding and Recovering, Tac. IP (Pos.2):**

- a. Make portions of TELEGRAPHIC TRANSMISSION SYSTEM\* , which have fulfilled their functions or are unnecessary, go away (discard by absorption, dissolving, evaporating, etc.).
- b. Conversely, restore consumable parts of TELEGRAPHIC TRANSMISSION SYSTEM\* directly in operation.

Separation principle for TELEGRAPHIC TRANSMISSION SYSTEM\* : Separation in time

Solution strategy for TELEGRAPHIC TRANSMISSION SYSTEM\* : Improving if a solution has not yet emerged

#### **2. Taking Out/ Adding, Str. IP (Pos.1):**

- a. Separate an interfering part or a property from TELEGRAPHIC TRANSMISSION SYSTEM\*, or single out the only necessary part (or property) of TELEGRAPHIC TRANSMISSION SYSTEM\*.
- b. Add new parts or properties to TELEGRAPHIC TRANSMISSION SYSTEM\*.

Separation principle for TELEGRAPHIC TRANSMISSION SYSTEM\* : Separation in space

Solution strategy for TELEGRAPHIC TRANSMISSION SYSTEM\* : Improving attributes

#### **28. Mechanics Substitution, Str. IP (Pos.13):**

- a. Replace a direct or manual action in, or for, TELEGRAPHIC TRANSMISSION SYSTEM\*, with a mechanical action or a tool.
- b. Replace a mechanical means in, or for, TELEGRAPHIC TRANSMISSION SYSTEM\*, with sensory (optical, acoustic, vibration, taste, smell, feelings or other sensory fields) means.
- c. Use mechanical, pneumatic, hydraulic, electric, magnetic, and electromagnetic, chemical, biological, psychological or other fields to improve action of TELEGRAPHIC TRANSMISSION SYSTEM\*.
- d. Change from static fields in, or for, TELEGRAPHIC TRANSMISSION SYSTEM\* to moving fields, from unstructured fields to those with structure, or vice versa.
- e. Use fields in conjunction with field-activated parts, components, or particles (e.g., magnetic field and ferromagnetic particles) in, or for, TELEGRAPHIC TRANSMISSION SYSTEM\*.

Separation principle for TELEGRAPHIC TRANSMISSION SYSTEM\* : Separation by condition

Solution strategy for TELEGRAPHIC TRANSMISSION SYSTEM\* : Improving attributes

#### **27. Cheap Short-Living Objects, Str. IP (Pos.8):**

- a. Replace or divide (either fully or partially) TELEGRAPHIC TRANSMISSION SYSTEM\* or its action with multiple inexpensive or short-living objects, actions, or sub-parts, which compress or simplify its characteristics and properties, and/or are limited but sufficient to achieve the desired objective.
- b. Comprising certain qualities of TELEGRAPHIC TRANSMISSION SYSTEM\* (e.g., the degree of participation, complexity, or lifetime), with no loss of functionality, to achieve the desired objective.

Separation principle for TELEGRAPHIC TRANSMISSION SYSTEM\* : Separation in subsystem  
Solution strategy for TELEGRAPHIC TRANSMISSION SYSTEM\* : Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security)

## COMPLEMENTARY CONTRADICTION 1

### Contradiction order wt.5

#### Parameter to improve: (-) 35. Adaptability or versatility

TO IMPROVE (UDE): TELEGRAPHIC TRANSMISSION SYSTEM has Less Adaptability or versatility to interaction variability of S2

#### Parameter to attenuate or preserve: (+) 34. Ease of change, repair or maintain

TO PRESERVE (DE): TELEGRAPHIC TRANSMISSION SYSTEM has More Desired ease of change, repair or maintenance to interact with S2

#### Inventive principles IP(s) : [1,16,7,4]

##### 1. Segmenting/ Integrating, Str. IP (Pos.5):

- a. Divide TELEGRAPHIC TRANSMISSION SYSTEM\* into existing and/or new parts, shapes, phases, states, or conditions.
- b. Integrate different parts, shapes, phases, states, or existing or new conditions of a TELEGRAPHIC TRANSMISSION SYSTEM\* into a single entity..
- c. Make TELEGRAPHIC TRANSMISSION SYSTEM\* easy to disassemble or assemble.
- d. Increase or reduce the degree of fragmentation or segmentation of TELEGRAPHIC TRANSMISSION SYSTEM\*.

Separation principle for TELEGRAPHIC TRANSMISSION SYSTEM\* : Separation in space / Separation in subsystem

Solution strategy for TELEGRAPHIC TRANSMISSION SYSTEM\* : Improving attributes; Improving performance; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security); Improving if a solution has not yet emerged

##### 16. Partial or Excessive Actions, Oper. IP (Pos.10):

- a. If the goal of TELEGRAPHIC TRANSMISSION SYSTEM\* is hard to achieve fully, using a given solution's method; then the problem may be considerably easier to solve, using "slightly less" or "slightly more" of the same method.

Separation principle for TELEGRAPHIC TRANSMISSION SYSTEM\* : Separation in time

Solution strategy for TELEGRAPHIC TRANSMISSION SYSTEM\* : Improving performance

##### 7. Nesting/ Dispersing, Tac. IP (Pos.7):

- a. Place TELEGRAPHIC TRANSMISSION SYSTEM\* fully or partially inside another object; place each object, in turn, fully or partially inside the other.
- b. Make one part of TELEGRAPHIC TRANSMISSION SYSTEM\* pass through a cavity in the other, or vice versa.
- c. If TELEGRAPHIC TRANSMISSION SYSTEM\* is nested with another object, and if necessary, apply a dispersing action.

Separation principle for TELEGRAPHIC TRANSMISSION SYSTEM\* : Separation in space / Separation in subsystem

Solution strategy for TELEGRAPHIC TRANSMISSION SYSTEM\* : Improving attributes

##### 4. Asymmetry/ Symmetry, Str. IP (Pos.14):

- a. Change the shape of TELEGRAPHIC TRANSMISSION SYSTEM\* from symmetrical to asymmetrical,

permanent, or variable in time, or vice versa.

b. If TELEGRAPHIC TRANSMISSION SYSTEM\* is asymmetrical, increase its degree of asymmetry, or vice versa.

Separation principle for TELEGRAPHIC TRANSMISSION SYSTEM\* : Separation in space

Solution strategy for TELEGRAPHIC TRANSMISSION SYSTEM\* : Improving attributes; Improving performance; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security); Improving if a solution has not yet emerged

## COMPLEMENTARY CONTRADICTION 2

### Contradiction order wt.8

#### Parameter to improve: (+) 2. Heaviness of stationary object

TO IMPROVE (UDE): TELEGRAPHIC TRANSMISSION SYSTEM has More Heaviness, value, cost, or restriction, whether physical or figurative interacting with S2

#### Parameter to attenuate or preserve: (+) 34. Ease of change, repair or maintain

TO PRESERVE (DE): TELEGRAPHIC TRANSMISSION SYSTEM has More Desired ease of change, repair or maintenance to interact with S2

Inventive principles IP(s) : [2,27,28,11]

#### 2. Taking Out/ Adding, Str. IP (Pos.1):

a. Separate an interfering part or a property from TELEGRAPHIC TRANSMISSION SYSTEM\*, or single out the only necessary part (or property) of TELEGRAPHIC TRANSMISSION SYSTEM\*.

b. Add new parts or properties to TELEGRAPHIC TRANSMISSION SYSTEM\*.

Separation principle for TELEGRAPHIC TRANSMISSION SYSTEM\* : Separation in space

Solution strategy for TELEGRAPHIC TRANSMISSION SYSTEM\* : Improving attributes

#### 27. Cheap Short-Living Objects, Str. IP (Pos.8):

a. Replace or divide (either fully or partially) TELEGRAPHIC TRANSMISSION SYSTEM\* or its action with multiple inexpensive or short-living objects, actions, or sub-parts, which compress or simplify its characteristics and properties, and/or are limited but sufficient to achieve the desired objective.

b. Comprising certain qualities of TELEGRAPHIC TRANSMISSION SYSTEM\* (e.g., the degree of participation, complexity, or lifetime), with no loss of functionality, to achieve the desired objective.

Separation principle for TELEGRAPHIC TRANSMISSION SYSTEM\* : Separation in subsystem

Solution strategy for TELEGRAPHIC TRANSMISSION SYSTEM\* : Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security)

#### 28. Mechanics Substitution, Str. IP (Pos.13):

a. Replace a direct or manual action in, or for, TELEGRAPHIC TRANSMISSION SYSTEM\*, with a mechanical action or a tool.

b. Replace a mechanical means in, or for, TELEGRAPHIC TRANSMISSION SYSTEM\*, with sensory (optical, acoustic, vibration, taste, smell, feelings or other sensory fields) means.

c. Use mechanical, pneumatic, hydraulic, electric, magnetic, and electromagnetic, chemical, biological, psychological or other fields to improve action of TELEGRAPHIC TRANSMISSION SYSTEM\*.

d. Change from static fields in, or for, TELEGRAPHIC TRANSMISSION SYSTEM\* to moving fields, from unstructured fields to those with structure, or vice versa.

e. Use fields in conjunction with field-activated parts, components, or particles (e.g., magnetic field and ferromagnetic particles) in, or for, TELEGRAPHIC TRANSMISSION SYSTEM\*.

Separation principle for TELEGRAPHIC TRANSMISSION SYSTEM\* : Separation by condition

Solution strategy for TELEGRAPHIC TRANSMISSION SYSTEM\* : Improving attributes

**11. Beforehand Cushioning, Tac. IP (Pos.17):**

a. Prepare emergency means, beforehand, to compensate for the relatively low reliability of TELEGRAPHIC TRANSMISSION SYSTEM\*.

Separation principle for TELEGRAPHIC TRANSMISSION SYSTEM\* : Separation in time

Solution strategy for TELEGRAPHIC TRANSMISSION SYSTEM\* : Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security)

**COMPLEMENTARY CONTRADICTION 3**

**Contradiction order wt.9**

**Parameter to improve: (-) 9. Speed**

TO IMPROVE (UDE): TELEGRAPHIC TRANSMISSION SYSTEM has Less Speed or rate of change interacting with S2

**Parameter to attenuate or preserve: (-) 35. Adaptability or versatility**

TO ATTENUATE OR PRESERVE (UDE): TELEGRAPHIC TRANSMISSION SYSTEM has Less Adaptability or versatility to interaction variability of S2

**Inventive principles IP(s) : [15,10,26,0]**

**15. Dynamics, Str. IP (Pos.4):**

a. Allow (or design) the characteristics of TELEGRAPHIC TRANSMISSION SYSTEM\*, external environment, or process to change to an optimal, or to find an optimal, operating condition.

b. Divide TELEGRAPHIC TRANSMISSION SYSTEM\* into parts that are capable of relative movement between each other.

c. If TELEGRAPHIC TRANSMISSION SYSTEM\* (or process) is rigid or inflexible, make it flexible or adaptive.

d. To enhance the dynamics of TELEGRAPHIC TRANSMISSION SYSTEM\* or the process, use feature(s) or object(s) available in the nearby environment.

Separation principle for TELEGRAPHIC TRANSMISSION SYSTEM\* : Separation in time

Solution strategy for TELEGRAPHIC TRANSMISSION SYSTEM\* : Improving attributes; Improving performance; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security); Improving if a solution has not yet emerged

**10. Preliminary Action, Str. IP (Pos.9):**

a. Perform the required change in, or for, TELEGRAPHIC TRANSMISSION SYSTEM\*, before it is needed (either fully or partially).

b. Pre-arrange TELEGRAPHIC TRANSMISSION SYSTEM\* and other objects, if necessary, in such a way that they can come into action from the most convenient place and without losing time for their delivery.

Separation principle for TELEGRAPHIC TRANSMISSION SYSTEM\* : Separation in time

Solution strategy for TELEGRAPHIC TRANSMISSION SYSTEM\* : Improving attributes; Improving performance

**26. Copying/ Replicating, Str. IP (Pos.15):**

a. Instead of using TELEGRAPHIC TRANSMISSION SYSTEM\*, or any of its unavailable, expensive, fragile parts or properties, use simpler and inexpensive copies or replicates to perform the desired function and, if possible, do so with improved characteristics and properties, while disregarding the harmful, undesirable, or unnecessary ones.

b. Imitate or replicate TELEGRAPHIC TRANSMISSION SYSTEM\*, or any of its parts or properties,

leveraging the relevant available environment.

c. If simple copies, or replicates are already being used, apply copies, or replicates of a higher level or technical complexity.

Separation principle for TELEGRAPHIC TRANSMISSION SYSTEM\* : Separation in space

Solution strategy for TELEGRAPHIC TRANSMISSION SYSTEM\* : Improving if a solution has not yet emerged

#### **COMPLEMENTARY CONTRADICTION 4**

**Contradiction order**

**Parameter to improve: n/a**

TO IMPROVE 0

**Parameter to attenuate or preserve: n/a**

TO ATTENUATE OR PRESERVE 0

**Inventive principles IP(s) : [0,0,0,0]**

#### **IX.B SOLUTION TO MORE RELEVANT CONTRADICTIONS BETWEEN NEEDS TO SATISFY (Cob.NS)**

Included in each inventive principle described below is the incidence level or position number it occupies in Table II. If it is not shown, it means that it only appears in Table IV. and requires attention.

#### **CONTRADICTION BETWEEN NEEDS TO SATISFY N° 1**

**Parameter to improve 34. Ease of change, repair or maintain**

MEJORAR > TELEGRAPHIC TRANSMISSION SYSTEM tiene More Desired ease of change, repair or maintenance to interact with S2

**Parameter to preserve 33. Ease of operation**

PRESERVAR > TELEGRAPHIC TRANSMISSION SYSTEM tiene más efecto deseable por párametro 33. Ease of operation

**Inventive principles IP(s) : [1,12,26,15]**

**1. Segmenting/ Integrating, Str. IP (Pos.5):**

a. Divide TELEGRAPHIC TRANSMISSION SYSTEM\* into existing and/or new parts, shapes, phases, states, or conditions.

b. Integrate different parts, shapes, phases, states, or existing or new conditions of a TELEGRAPHIC TRANSMISSION SYSTEM\* into a single entity..

c. Make TELEGRAPHIC TRANSMISSION SYSTEM\* easy to disassemble or assemble.

d. Increase or reduce the degree of fragmentation or segmentation of TELEGRAPHIC TRANSMISSION SYSTEM\*.

Separation principle for TELEGRAPHIC TRANSMISSION SYSTEM\* : Separation in space / Separation in subsystem

Solution strategy for TELEGRAPHIC TRANSMISSION SYSTEM\* : Improving attributes; Improving performance; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security); Improving if a solution has not yet emerged

**12.- Equipotentiality, Tac. IP (Pos.):**

a. In a potential field, limit position changes or energy variations of TELEGRAPHIC TRANSMISSION SYSTEM\*.

b. Change operating conditions to eliminate the need to change the position or energy quality of TELEGRAPHIC TRANSMISSION SYSTEM\* in a potential field.

Separation principle for TELEGRAPHIC TRANSMISSION SYSTEM\* : Separation by condition to satisfy

contradiction

Solution strategy for TELEGRAPHIC TRANSMISSION SYSTEM\* : Improving if a solution has not yet emerged

**26. Copying/ Replicating, Str. IP (Pos.15):**

- a. Instead of using TELEGRAPHIC TRANSMISSION SYSTEM\*, or any of its unavailable, expensive, fragile parts or properties, use simpler and inexpensive copies or replicates to perform the desired function and, if possible, do so with improved characteristics and properties, while disregarding the harmful, undesirable, or unnecessary ones.
- b. Imitate or replicate TELEGRAPHIC TRANSMISSION SYSTEM\*, or any of its parts or properties, leveraging the relevant available environment.
- c. If simple copies, or replicates are already being used, apply copies, or replicates of a higher level or technical complexity.

Separation principle for TELEGRAPHIC TRANSMISSION SYSTEM\* : Separation in space

Solution strategy for TELEGRAPHIC TRANSMISSION SYSTEM\* : Improving if a solution has not yet emerged

**15. Dynamics, Str. IP (Pos.4):**

- a. Allow (or design) the characteristics of TELEGRAPHIC TRANSMISSION SYSTEM\*, external environment, or process to change to an optimal, or to find an optimal, operating condition.
- b. Divide TELEGRAPHIC TRANSMISSION SYSTEM\* into parts that are capable of relative movement between each other.
- c. If TELEGRAPHIC TRANSMISSION SYSTEM\* (or process) is rigid or inflexible, make it flexible or adaptive.
- d. To enhance the dynamics of TELEGRAPHIC TRANSMISSION SYSTEM\* or the process, use feature(s) or object(s) available in the nearby environment.

Separation principle for TELEGRAPHIC TRANSMISSION SYSTEM\* : Separation in time

Solution strategy for TELEGRAPHIC TRANSMISSION SYSTEM\* : Improving attributes; Improving performance; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security); Improving if a solution has not yet emerged

**CONTRADICTION BETWEEN NEEDS TO SATISFY N° 2**

**Parameter to improve 34. Ease of change, repair or maintain**

MEJORAR > TELEGRAPHIC TRANSMISSION SYSTEM tiene More Desired ease of change, repair or maintenance to interact with S2

**Parameter to preserve 39. Productivity**

PRESERVAR > TELEGRAPHIC TRANSMISSION SYSTEM tiene más efecto deseable por párametro 39. Productivity

**Inventive principles IP(s) : [1,32,10,0]**

**1. Segmenting/ Integrating, Str. IP (Pos.5):**

- a. Divide TELEGRAPHIC TRANSMISSION SYSTEM\* into existing and/or new parts, shapes, phases, states, or conditions.
- b. Integrate different parts, shapes, phases, states, or existing or new conditions of a TELEGRAPHIC TRANSMISSION SYSTEM\* into a single entity..
- c. Make TELEGRAPHIC TRANSMISSION SYSTEM\* easy to disassemble or assemble.
- d. Increase or reduce the degree of fragmentation or segmentation of TELEGRAPHIC TRANSMISSION SYSTEM\*.

Separation principle for TELEGRAPHIC TRANSMISSION SYSTEM\* : Separation in space / Separation in subsystem

Solution strategy for TELEGRAPHIC TRANSMISSION SYSTEM\* : Improving attributes; Improving performance; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security); Improving if a solution has not yet emerged

**32. Perception/ Appearance/ Color Changes, Str. IP (Pos.):**

- a. Change how is perceived, the appearance or shape of TELEGRAPHIC TRANSMISSION SYSTEM\* in relation to the object (S2) with which it interacts.
- b. Change the color, or appearance, of TELEGRAPHIC TRANSMISSION SYSTEM\* or its external environment.
- c. Change the transparency of TELEGRAPHIC TRANSMISSION SYSTEM\* or its external environment.

Separation principle for TELEGRAPHIC TRANSMISSION SYSTEM\* : Separation by condition

Solution strategy for TELEGRAPHIC TRANSMISSION SYSTEM\* : Improving if a solution has not yet emerged

**10. Preliminary Action, Str. IP (Pos.9):**

- a. Perform the required change in, or for, TELEGRAPHIC TRANSMISSION SYSTEM\*, before it is needed (either fully or partially).
- b. Pre-arrange TELEGRAPHIC TRANSMISSION SYSTEM\* and other objects, if necessary, in such a way that they can come into action from the most convenient place and without losing time for their delivery.

Separation principle for TELEGRAPHIC TRANSMISSION SYSTEM\* : Separation in time

Solution strategy for TELEGRAPHIC TRANSMISSION SYSTEM\* : Improving attributes; Improving performance

**CONTRADICTION BETWEEN NEEDS TO SATISFY N° 3**

**Parameter to improve 34. Ease of change, repair or maintain**

MEJORAR > TELEGRAPHIC TRANSMISSION SYSTEM tiene More Desired ease of change, repair or maintenance to interact with S2

**Parameter to preserve 38. Extent of automation/ autonomy**

PRESERVAR > TELEGRAPHIC TRANSMISSION SYSTEM tiene más efecto deseable por párametro 38.

Extent of automation/ autonomy

**Inventive principles IP(s) : [34,35,7,13]**

**34. Discarding and Recovering, Tac. IP (Pos.2):**

- a. Make portions of TELEGRAPHIC TRANSMISSION SYSTEM\* , which have fulfilled their functions or are unnecessary, go away (discard by absorption, dissolving, evaporating, etc.).
- b. Conversely, restore consumable parts of TELEGRAPHIC TRANSMISSION SYSTEM\* directly in operation.

Separation principle for TELEGRAPHIC TRANSMISSION SYSTEM\* : Separation in time

Solution strategy for TELEGRAPHIC TRANSMISSION SYSTEM\* : Improving if a solution has not yet emerged

**35. Transformation/ Parameter Changes, Str. IP (Pos.6):**

- a. Change TELEGRAPHIC TRANSMISSION SYSTEM\*'s physical or chemical state (e.g., in shape, in composition, to a gas, liquid, solid or plasma).
- b. Change the composition or condition of TELEGRAPHIC TRANSMISSION SYSTEM\* by adding or removing components.

c. Change the concentration or consistency; change the degree of flexibility; change the temperature or the level of internal activity of TELEGRAPHIC TRANSMISSION SYSTEM\*.

Separation principle for TELEGRAPHIC TRANSMISSION SYSTEM\* : Separation by condition / Separation alternative

Solution strategy for TELEGRAPHIC TRANSMISSION SYSTEM\* : Improving attributes; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security)

**7. Nesting/ Dispersing, Tac. IP (Pos.7):**

- a. Place TELEGRAPHIC TRANSMISSION SYSTEM\* fully or partially inside another object; place each object, in turn, fully or partially inside the other.
- b. Make one part of TELEGRAPHIC TRANSMISSION SYSTEM\* pass through a cavity in the other, or vice versa.
- c. If TELEGRAPHIC TRANSMISSION SYSTEM\* is nested with another object, and if necessary, apply a dispersing action.

Separation principle for TELEGRAPHIC TRANSMISSION SYSTEM\* : Separation in space / Separation in subsystem

Solution strategy for TELEGRAPHIC TRANSMISSION SYSTEM\* : Improving attributes

**13. Inverse or Indirect Action, Str. IP (Pos.):**

a. Inverse the applied action or apply an indirect action to perform the current function of TELEGRAPHIC TRANSMISSION SYSTEM\* to interact with object (S2)

It should be identified how TELEGRAPHIC TRANSMISSION SYSTEM\* currently performs an action with S2 Object and from there evaluate an inverse or indirect action.

- b. Make moving parts of TELEGRAPHIC TRANSMISSION SYSTEM\* (or the external environment) fixed, and fixed parts moving.
- c. Turn TELEGRAPHIC TRANSMISSION SYSTEM\* (or process) “upside down”, “change the position”, “change the condition”.

Separation principle for TELEGRAPHIC TRANSMISSION SYSTEM\* : Separation in space / Separation inverse

Solution strategy for TELEGRAPHIC TRANSMISSION SYSTEM\* : Improving attributes; Improving performance; Improving 7 quality factors (Quality, Reliability, Maintainability, Supportability, Human Factors, Safety, Security); Improving if a solution has not yet emerged

**Anexo**

**List of applicable Inventive Principles for Innovation Solutions**

IP.1. Segmenting/ Integrating	IP.21. Skipping/ Avoiding
IP.2. Taking out/ Adding	IP.22. Convert harm in benefit
IP.3. Local Quality	IP.23. Feedback
IP.4. Asymmetry/ Symmetry	IP.24. Intermediary
IP.5. Merging/ Separating	IP.25. Self-service
IP.6. Universality	IP.26. Copying/ Replicating
IP.7. Nesting/ Dispersing	IP.27. Cheap Short-Living Objects
IP.8. Anti-Weight/ Compensation	IP.28. Mechanics Substitution

IP.9. Preliminary Anti-action	IP.29. Controllable Soft Variables
IP.10. Preliminary Action	IP.30. Simple Shapes/ Ways to Interact
IP.11. Beforehand Cushioning	IP.31. 31.Using/ Removing Unused Parts
IP.12. Equipotentiality	IP.32. Perception/ Appearance/ Color Changes
IP.13. Reverse or Indirect Action	IP.33. Homogeneity / Compatibility
IP.14. Spheroidality - Curvature - Angle	IP.34. Discarding and Recovering
IP.15. Dynamics	P.35. Transformation / Parameter Changes
IP.16. Partial or Excessive Actions	IP.36. Phase, State or Condition Transitions
IP.17. Another Dimension or Field	IP.37. Useful Perceptible Change
IP.18. Mechanical Vibrations/ Energy Variations	IP.38. Strong or Quick Reactions
IP.19. Time-Varying Action/ Periodic or Pulsating	IP.39. Inert Atmosphere / Environment
IP.20. Continuity of Useful Action	IP.40. Composite Materials/ Conditions

Available Aatrizinventor solutions: 0 - You can get more solutions in home page link.

### **ALGORITHM AATRIZINVENTOR FROM NATURE'S L.I.**