

Table 1 *Relation between the Creative Principles and the Inventive TRIZ Principles*

Inventive TRIZ principles	Creative principles
<u>Connect:</u> 5. merge, couple 20. continuity of a useful action 24. fitting, intermediate 38. strong oxidants 40. composite material	<u>Demarcation:</u> Connect ↔ Divide Connect, combine, continuity, collectively, transparent Divide, separate, share, barrier, pause, inert, isolation
<u>Division:</u> 1. disassemble 2. separation 3. local quality 31. porous materials 39. neutral atmosphere or inert environment	
8. counterweight 33. homogeneity 12. equipotentiality	<u>Contrast - Balance:</u> contrast – gradient - equality
6. universality 29. pneumatic and hydraulic 30. flexible films, foils, and membranes	<u>Elasticity - Stability:</u> adapt, flexible – stiff, rigid
16. excessive action 21. skipping, quick mode 37. thermal expansion	<u>Growth:</u> expansion – compression/shrink/focus extension (1D) - shrink (1D) excess – lack
18. mechanical vibration (resonance) 19. periodical or pulsed action 32. color change	<u>Periodicity</u>

Inventive TRIZ principles	Creative principles
9. pre-eliminatory anti action 13. inversion 22. convert harm to benefit	<u>Order:</u> sequence inversion nematic, smectic; irreversible
14. spheroidality, curvatures 23. feedback 25. self-servicing	<u>Feedback</u> , circular
9. pre-eliminatory anti action 10. pre-eliminatory action 11. beforehand cushioning	<u>Prepare, planning, forecasting</u>
27. inexpensive short lived object, disposable 28. substituting a mechanical with an electromagnetic system 34. discarding & recovering	<u>Storage - Substitution:</u> (preserve/conserve - delete, forget, mistake, failure)
29. apply pneumatic and hydraulic systems 35. changing state, chemical or physical properties 36. phase transition	<u>Phase transition</u> change of material state solid – liquid – gaseous – plasma
8. counterweight 29. apply pneumatic and hydraulic systems 37. thermal expansion	<u>Force:</u> attract – repel motivation - demotivation
26. copy	<u>Repeat:</u> imitate, copy, replicate – mistake
15. dynamics	<u>Motion:</u> accelerate – fix, attach – brake
30. flexible films, foils, and membranes	<u>Deformation:</u> fold, bent form (spherical): concave – planar - convex

Inventive TRIZ principles	Creative principles
7. embedded structures (Matryoschka dolls)	<u>Hierarchical:</u>
17. change dimension	<u>Perspective:</u> change point of view expand view - focus
4. Asymmetry	<u>Symmetry – Asymmetry</u>
30. flexible films, foils, and membranes	<u>Recognize:</u> mask – uncover, discover
31. porous materials	<u>Resources – Waste:</u> energy- waste, material, information
	<u>Directionality:</u> unidirectional – omnidirectional
	<u>Dimension:</u> (3D, 2D, 1D, time)
	<u>Rotation:</u>
	Crosslink, <u>branching:</u>

Note. Remarks:

- A creative principle contains a synonym (e.g., for discipline-specific languages) and its antonym.
- A hyphen “-“ means a switch from one contrast to the other or synonym-antonym, such as “black-grey-white.”