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*June Article*

# 40 Inventive Principles with Social Examples

Editor's note: John Terninko sent this note with the accompanying list of examples of social applications of the 40 principles:
One day two years ago I was sitting around realizing that there was little demonstrated use of TRIZ to social applications. In the spirit of anologic thought I tried seeing what the 40 Principles could do. It did get me thinking.

I recently have had a letter from a graduate student challenging the legitimacy of applying the 40 principles to non-technical issues (such as our article in Sept. 99 on TRIZ for business) since Altshuller "proved" the 40 principles only for technical issues. My response was that he didn't prove anything, but he and his research colleagues gathered a whole lot of data that showed that these concepts are useful. For the non-technical issues, this kind of set of examples shows how the same principles stimulate analogic thinking in a broad set of areas, and the examples may be useful to other people to stimulate their thinking, just the way that the technical examples are used for the technical 40 principles.

Readers who have any examples are invited send them to the TRIZ Journal and we'll continue to compile and publish the list. -Ellen Domb,

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**Principle 1. Segmentation**

**A. Divide an event into independent persons.**

***Divide education subject into bit sized units.***

***Organize a complex task into subtasks.***

***A large project can be broken into smaller units for individuals to perform.***

**B. Make an event easy to disassemble.**

***Products are designed for easy disassembly to satisfy Germany's recycling program.***

**C. Increase the degree of fragmentation or segmentation.**

***A cause and effect chain can be used to describe a system to identify an exhaustive set of problem statments. Tens of problem statements replace a single problem.***

**Principle 2. Taking out**

**A. Separate an interfering component or property from an event, or single out the only necessary component (or property) of an event.**

***Use the four separation principles to eliminate conflicting requirements***

***Ask what is the purpose of the event and only pursue that activity. A discussion is simplified by eliminating all the extraneous topics.***

**Principle 3. Local quality**

**A. Change an event's structure from uniform to non-uniform, change an external environment (or external influence) from uniform to non-uniform.**

***Select a variety of activities for different muscle groups for cross training.***

***Develop addition ankle strength by running on trails rather than roads.***

**B. Make each person/system of an event function in conditions most suitable for its operation.**

***Assign work schedules to match employees normal awake times.***

***Practice before competing.***

***Match personality types to the task to be performed.***

**C. Make each person/system of an event fulfill a different and useful function.**

***Hire a separate person/system for each function to be performed in a restaurant.***

**Principle 4. Asymmetry**

**A. Change the shape of an event from symmetrical to asymmetrical.**

***Select a workforce which heterogeneous in all dimensions***

***Mix pedagogy for effective learning.***

**B. If an event is asymmetrical, increase its degree of asymmetry.**

***Normal classes in school have students with different abilities. Select additional students for more diversity by considering native language, age, physical and mental abilities, religion etc.***

**Principle 5. Merging**

**A. Bring closer together (or merge) identical or similar events, assemble identical or similar persons/systems to perform parallel operations.**

***The affinity diagram can be used to identify natural cluster of the voice of the customer.***

**B. Make operations contiguous or parallel; bring them together in time.**

***Use a PERT chart to arrange the event to complete a complex project.***

**Principle 6. Universality**

**A. Make a person/system or event perform multiple functions; eliminate the need for other persons.**

***Replace specialist on an assembly line have generalist.***

**Principle 7. "Nested doll"**

**A. Place one event inside another; place each event, in turn, inside the other.**

***Create an organization with several levels and with several people within each organizational unit.***

**B. Make one person/system pass through a cavity in the other.**

***Allow anyone in an organization to communicate directly to any higher level.***

**Principle 8. Anti-weight**

**A. To compensate for the weight of an event, merge it with other events that provide lift.**

***Assign teacher aids to provide better coverage of the students.***

**B. To compensate for the weight of an event, make it interact with the environment (e.g. use aerodynamic, hydrodynamic, buoyancy and other forces).**

***Send juvenile offenders to a boot camp environment.***

**Principle 9. Preliminary anti-action**

**A. If it will be necessary to do an action with both harmful and useful effects, this action should be replaced with anti-actions to control harmful effects.**

***Have a vaccination before going to unhealthy places.***

**B. Create beforehand stresses in an event that will oppose known undesirable working stresses later on.**

***Any boot camp environment for military applications, peace corps, cross cultural training and immersion programs for language***

**Principle 10. Preliminary action**

**A. Perform, before it is needed, the required change of an event (either fully or partially).**

***Anticipate future staffing requirements by either hiring new employees or providing training for existing employees.***

**B. Pre-arrange events such that they can come into action from the most convenient place and without losing time for their delivery.**

***Just in time delivery and manufacturing.***

**In California temporary staffing agency pre-trains people in OSHA regulations, ISO9000 so they are productive the first hour of work on short notice.**

**Principle 11. Beforehand cushioning**

**A. Prepare emergency means beforehand to compensate for the relatively low reliability of an event.**

***Learn CPR.***

**Principle 12. Equipotentiality**

**A. In a potential field, limit position changes (e.g. change operating conditions to eliminate the need to raise or lower events to match requirements).**

**Some school make their classes homogeneous in ability and interest, which reduces the need for adjustment by the teacher.**

**Principle 13. 'The other way round'**

**A. Invert the action(s) used to solve the problem (e.g. instead of cooling an event, heat it).**

***Home visits by the medical doctor***

**B. Make movable persons/systems (or the external environment) fixed, and fixed persons/systems movable).**

***Have the student teach the class***

***Design the instructions to be self explanatory without reading.***

***Programmed learn adapts to the level of the student*.**

***Just in time delivery system.***

***Use PERT to schedule events.***

***When the pupil is ready the teacher will appear***

***Meals on wheels program***

**C. Turn the event (or process) 'upside down'.**

***Have the boss report to the subordinate.***

**Nordstroms and GE have the customer at the top of the organization chart and the CEO at the bottom.**

**Principle 14. Spheroidality - Curvature**

**A. Instead of using rectilinear persons, surfaces, or forms, use curvilinear ones; move from flat surfaces to spherical ones; from persons/systems shaped as a cube (parallelepiped) to ball-shaped structures.**

***Have overweight people cuddle troubled children and premature babies, ala Leo Pesqalia***

***Rounded personalities providing customer service.***

**B. Use rollers, balls, spirals, domes.**

***Sweet talk the customer into satisfaction.***

**C. Go from linear to rotary motion, use centrifugal forces.**

***Use a continuously changing ranking of jobs to be completed***

**Principle 15. Dynamics**

**A. Allow (or design) the characteristics of an event, external environment, or process to change to be optimal or to find an optimal operating condition.**

***Build a "Learning Organization" as suggested by Peter Senge.***

***Use fuzzy logic for decion making.***

**B. Divide an event into persons/systems capable of movement relative to each other.**

***Project team selects and deselects its own members through out the project life.***

**C. If an event (or process) is rigid or inflexible, make it movable or adaptive.**

***Increase the % of work force that are generalist rather than specialists.***

***Hire creative people***

**Principle 16. Partial or excessive actions**

**A. If 100 percent of an event is hard to achieve using a given solution method then, by using 'slightly less' or 'slightly more' of the same method, the problem may be considerably easier to solve.**

***Use stretch goals for employees***

***Over staff a project.***

**Principle 17. Another dimension**

**A. To move an event in two- or three-dimensional space.**

***Manage an organization with LOVE. Tom Hanson has been offering helping organizations such as the UN use this model.***

**Create holograms of staff members for a virtual organization.**

**B. Use a multi-story arrangement of events instead of a single-story arrangement.**

***Use a matrix organization structure***

**C. Tilt or re-orient the event, lay it on its side.**

***Have the boss behave as if the employee was their customer.***

**D. Use 'another side' of a given area.**

***Introduce McGregor's "Human Side of the Organization."***

**Principle 18. Mechanical vibration**

**A. Cause an event to oscillate or vibrate.**

**Re-organize every six months**

**B. Increase its frequency (even up to the ultrasonic).**

***Re-organize every week.***

**C. Use an event's resonant frequency.**

**Since we all have a new body every seven years, re-organize every seven years.**

**D. Use piezoelectric vibrators instead of mechanical ones.**

***Have natural phenomenon indicate when to re-organize.***

**E. Use combined ultrasonic and electromagnetic field oscillations.**

***Consult an Oracle and listen to your gut.***

**Principle 19. Periodic action**

**A. Instead of continuous action, use periodic or pulsating actions.**

***Random checking for drug testing***

***Random reinforcement.***

**B. If an action is already periodic, change the periodic magnitude or frequency.**

***Vary the interval training for a runner.***

**C. Use pauses between impulses to perform a different action.**

***A hotel Concierge has free time that can be used to study Japanese to better interact with the hotel guests.***

**Principle 20. Continuity of useful action**

**A. Carry on work continuously; make all persons/systems of an event work at full load, all the time.**

***Down size.***

**B. Eliminate all idle or intermittent actions or work.**

***Carry a cell phone.***

**Carry notebook computer.**

**Principle 21. Skipping**

**A. Conduct a process, or certain stages (e.g. destructive, harmful or hazardous operations) at high speed.**

***Answer questions quickly, with not thinking, to prevent rationalization.***

***Listen to your gut when making decisions.***

**Answer all e-mail when received to prevent building up a "to do" list.**

**Principle 22. “Blessing in disguise” or “Turn Lemons into Lemonade”**

**A. Use harmful factors (particularly, harmful effects of the environment or surroundings) to achieve a positive effect.**

***Make mowing the lawn a workout rather than a chore.***

***Hire a computer hacker to prevent others damaging you system.***

***Use waste heat to generate electric power.***

**B. Eliminate the primary harmful action by adding it to another harmful action to resolve the problem.**

***Make a team of two dysfunctional individuals such as an extremely structured individual and a space cadet.***

***"The Odd Couple" movie and TV show*.**

**C. Amplify a harmful factor to such a degree that it is no longer harmful.**

***Use the Peter Principle and promote the individual.***

***The pointy haired boss in the Dilbert cartoon.***

**Principle 23. Feedback**

**A. Introduce feedback (referring back, cross-checking) to improve a process or action.**

***Monthly annual review with employee.***

***Monthly review of Hoshin process***

**B. If feedback is already used, change its magnitude or influence.**

***Get your big brother to talk to the bully***

***Increase the number of dimensions used for reviewing employee or Hoshin*.**

**Principle 24. 'Intermediary'**

**A. Use an intermediary carrier article or intermediary process.**

***Have the union representative talk to management.***

***Have your religious leader talk your God.***

***Medians claim to provide this function between the living and the dead.***

***An Ombudsman in town government.***

***A place for a witnesses to call to give information about a crime without revealing their name.***

**B. Merge one event temporarily with another (which can be easily removed).**

***Use and arbitrator for a sensitive discussion.***

***Hire temporary workers.***

**Principle 25. Self-service**

**Make an event serve itself by performing auxiliary helpful functions**

***Customers at fast food restaurants pick up their order, remove tray from table and deposit garbage in can.***

***Gasoline pumps accept credit cards and purchaser fills vehicle.***

***Customers of banks use ATMs for money transactions. In fact some bank now chare extra to use a teller.***

***A soda fountain pump that runs on the pressure of the carbon dioxide that is used to "fizz" the drinks. This assures that drinks will not be flat, and eliminates the need for sensors.***

**B. Use waste resources, energy, or substances.**

***Hire excons and current convicts.***

**Principle 26. Copying**

**A. Instead of an unavailable, expensive, or fragile event, use simpler and inexpensive copies.**

***Ignore, NIH (not invented here) and use competitors design.***

***Buy the no-name brand.***

**B. Replace an event, or process with optical copies.**

***Conduct team meeting using video conferencing, fax, e-mail and picture phone.***

**C. If visible optical copies are already used, move to infrared or ultraviolet copies.**

**Principle 27. Use Cheap (sometimes short-living) Replacement Events**

**A. Replace an expensive event with multiple inexpensive events, compromising certain qualities (such as service life, for instance).**

***Lay off senior employees and hire back as temporaries or replace with junior employees.***

**Principle 28. Substitution for mechanical means**

**A. Replace a mechanical means with sensory (optical, acoustic, taste or smell) means.**

***Eliminate face to face communications with in the organization and outside the organization.***

**B. Use electric, magnetic and electromagnetic fields to interact with the event.**

***Replace the office with a virtual office with everyone working from home.***

**C. Change from static to movable fields, from unstructured fields to those having structure.**

***The classic floating crap game.***

***Mobile Library.***

***Meals on wheels.***

***Mobile office in the car.***

**D. Use fields in conjunction with field-activated (e.g. ferromagnetic) particles.**

***Integrate humans with internet inputs.***

**"Eyeglasses" that have a computer screen projected on one lens, or >that**

**support the projector that focuses on one retina (used now for people >who work in warehouses to see constantly changing lists, experimentally used for service technicians who need to access lots of data on a wide variety of models of stuff they fix. Probably also used for doctors..)**

**Scuba diving computer that attaches to the mask. Voice tells you depth, time, rate of ascent, and if you have done something that requires a decompression stop.**

**Principle 29. Pneumatics and hydraulics**

**A. Use gas and liquid persons/systems of an event instead of solid persons/systems (e.g. inflatable, filled with liquids, air cushion, hydrostatic, hydro-reactive).**

***Look at work flow and information flow as fluid flow, a hydraulic model rather than a flow chart.***

**Principle 30. Flexible shells and thin films**

**A. Use flexible shells and thin films instead of three-dimensional structures**

***Flat organization chart.***

**B. Isolate the event from the external environment using flexible shells and thin films.**

***Have engineering talk directly to the customer and go to the customer location rather than through marketing.***

**Principle 31. Porous materials**

**A. Make an event porous or add porous elements (inserts, coatings, etc.).**

***Encourage open mindedness of employees to new ideas.***

**If an event is already porous, use the pores to introduce a useful substance or function.**

***Provide training directed towards new corporate directions.***

**Principle 32. Color changes**

**A. Change the color of an event or its external environment.**

***Increase employee diversity.***

**Use grow lights in the office.**

**B. Change the transparency of an event or its external environment.**

***Design an organization which is transparent to customers, they come and get what they want (information, books or ...).***

**Principle 33. Homogeneity**

**A. Make events interacting with a given event of the same material (or material with identical properties).**

***Provide uniform service for customers.***

**Principle 34. Discarding and recovering**

**A. Make portions of an event that have fulfilled their functions go away (discard by dissolving, evaporating, etc.) or modify these directly during operation.**

***Encourage and make lazy employees transfer.***

**B. Conversely, restore consumable persons/systems of an event directly in operation.**

***Employees keep up with the latest thinking, technology and philosophy.***

**Principle 35. Parameter changes**

**A. Change an event's physical state (e.g. to a gas, liquid, or solid.**

***One of the models for personal growth describes the personality thawing for change and refreezing for a new unchangeable behavior.***

**B. Change concentration or consistency.**

***Design a rapid for rapid staffing changes on a project.***

**C. Change the degree of flexibility.**

***Create Senge's learning organization.***

**D. Change the temperature.**

***Employees own the company.***

**Principle 36. Phase transitions**

**A. Use phenomena occurring during phase transitions (e.g. volume changes, loss or absorption of heat, etc.).**

***Necessity is the mother of invention.***

***During times of disaster human compassion reaches a high level.***

**Principle 37. Thermal expansion**

**A Use thermal expansion (or contraction) of materials.**

***Self regulating organization.***

**B. If thermal expansion is being used, use multiple materials with different coefficients of thermal expansion.**

***Team members should represent a range of personalities such a Ned Herman's four quadrants of the brain.***

**Principle 38. Strong oxidants**

**A. Replace common air with oxygen-enriched air.**

***Select a team of abrasive personalities.***

**B. Replace enriched air with pure oxygen.**

***Staff with high performers.***

**C. Expose air or oxygen to ionizing radiation.**

**D. Use ionized oxygen.**

***Increased personalization of product design.***

**E. Replace ozonized (or ionized) oxygen with ozone.**

***Highly creative individuals who understand the voice of the customer.***

**Principle 39. Inert atmosphere**

**A. Replace a normal environment with an inert one.**

***Develop disaster procedures (flood, hurricane etc.) which are robust against sources of variation.***

**B. Add neutral persons, or inert additives to an event.**

***When setting up a blind date at a party, invite other guests ("inert" guests) Sort of an old "I love Lucy plot.***

***Staff customer service, the complaint department with individuals with the patients of Job***

**Principle 40. Composite materials**

**A. Change from uniform to composite (multiple) materials.**

***Instead of having a homogeneous workforce hire Renaissance workers.***



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