TRIZ
x

40 INVENTIVE PRINCIPLES WITH EXAMPLES

BUSINESS AND MANAGEMENT SYSTEMS AND APPLICATIONS

© ICG Training & Consulting 2022

The document presents an adapted and modified version of 40 innovative principles to eliminate contradictions and search for ideas for new solutions in the areas of business and management. This version includes 40 techniques, 190 recommendations, and 402 examples.

Originally, 40 inventive principles were developed by the author of TRIZ G. S. Altshuller for technical applications[1] and later adapted to solve the contradictions that arise in business and management.

The titles and formulations of techniques in this document may not coincide with the names and formulations of techniques in other TRIZ literature, as they were changed based on the experience and research conducted by the company ICG T&C when creating a document.

In particular, in comparison with the original version of 40 standard techniques for eliminating technical contradictions, the following changes were made:

- Completely changed the content of principles 8, 9, 12, 14, 18, 19, 28, 29, 30, 31, 36, 37, 38
- Changed the titles of principles 12, 14, 18, 28, 29, 30, 31, 32, 36, 37, 38.
- Recommendations for the use of the principle were revised and adapted in each recommendation, and new recommendations were added.

This version is based on the materials by G. Altshuller, D. Mann, R. Fulbright, K. Rea, V. Petrov, V. Souchkov.

[1] Altshuller G. S., 1973. Standard techniques for resolving technical contradictions. Official Foundation of G. S. Altshuller. https://www.altshuller.ru/

#1: SEGMENTATION

Strategies and recommendations

- ○ Divide a system or its subsystem(tangible or intangible) to independent parts or interconnected parts.
- ○ Divide a system or its subsystem into parts so that some its part can be easily taken away when necessary (and brought back later if needed).
- ○ Assemble a system or its subsystem from smaller segments.
- ○ Increase the degree of segmentation by composing a system or its subsystem from a number of smaller subsystems or objecs.
- ○ Break a process or activity to smaller segments.
- ○ Increase the degree of segmentation of homogeneous systems or processes.
- ○ Increase the difference between process segments.

- ❑ Decomposing a large business unit to a number of smaller units.
- ❑ Breaking a project to a number of smaller segments helps to better control deadlines and overall project execution.
- ❑ Evaluating a complex activity by a number of different parameters in order to keep the overall performance balanced.
- ❑ Breaking evaluation criteria to a number of smaller ones to improve accuracy of evaluation.
- ❑ Delegation: splitting a process of decision making.
- ❑ A business offer which consists of a number of selectable and optional components.
- ❑ "Empowerment": segmentation of decision making.
- ❑ Decomposing a large restaurant to a number of smaller, cozier "home"- like restaurants.
- ❑ Large advertisement can be placed in a big magazine. Most effective will be many smaller advertisements in many types of smaller magazines.
- ❑ Marketing segmentation by demographics, sociographics, psychographics, lifestyles, etc (creation of micro-niches).
- ❑ Assembly of different configurations of final products and services from components.
- ❑ Intraday trading instead of long-term investments.

#2: TAKING AWAY — EXAMPLES

Strategies and recommendations

- ○ If some part of a system or a process interferes with other parts or creates a negative effect, remove ("take away") the interfering part of the system (or activity of the process) by separating it from the system or the process.
- ○ Isolate interfering part of a system or a process from the rest of the system or the process.
- ○ If some property of a system interferes with other properties of functions of the system, find out what part of the system is a carrier of the property and separate it from the system by creating another system or transferring the property to some other part of the system.
- ○ Remove the necessary property of a system or a process by creating a system or a process which has the required property only.

EXAMPLES

- ❑ Outsourcing non-core parts of business systems and business processes.
- ❑ Locating development teams in geographic areas with concentration of top competence.
- ❑ Removing dangerous manufacturing unit outside the city.
- ❑ Separating development and production activities.
- ❑ Separating manufacturing and reparation.
- ❑ Taking away an interfering part of the business process.
- ❑ Performing marketing studies directly at customer side.
- ❑ Increasing sales by bringing a product to a customer's side.
- ❑ Letting customers exclude those parts of the product that they do not need before purchase.
- ❑ "Isolate" in time or space a part of a business system or a process that creates tension.
- ❑ Distant learning.
- ❑ Working from a home office.
- ❑ Lean manufacturing.
- ❑ Activity-Based Costing instead of allocation cost accounting.
- ❑ Establishing a number of new companies with new products which promote the same brand.

#3: LOCAL QUALITY

Strategies and recommendations

- Instead of a uniform structure of a system or its subsystem, use non-uniform structure of the system or the subsystem.
- Instead of a uniform structure of a process, use non-uniform structure of the process.
- Vary in time or space a part of a process that causes problems.
- Instead of uniform structure of environment, use non-uniform structure of environment.
- If two (or more) different functions have to be performed by the same subsystem but this causes problems, divide this subsystems into two (or more) subsystems.
- Make parts of a system and its environment function in most suitable and proper conditions for each part.
- Make activities within a process and its environment function in most suitable and proper conditions for each activity.

- ❑ Profit centers make an identifiable contribution to the organization's profits.
- ❑ Franchise fast food outlets have local dishes in addition to normal product range.
- ❑ Distribution center is located near to customers.
- ❑ Web pages are delivered in local languages.
- ❑ Sales consultants in a department store specializing in different subjects.
- ❑ Products with similar or complementary functionality are placed close to each other in a store.
- ❑ Working hours phased to accommodate people working on international, shifted time-zone projects.
- ❑ Local people are hired to communicate with local customers.
- ❑ Staff specialists in centers of excellence.
- ❑ "Kids areas" in restaurants.
- ❑ Workplace customized to ergonomic and psychological needs.
- ❑ Instead of a single sales person, several experts in different areas are used to properly answer customer's questions.
- ❑ Coffee rooms have warm relaxing decoration.
- ❑ Involving experts to assist relevant project stages.

Strategies and recommendations

○ If a system or a process (or an interaction) is symmetrical, consider making it asymmetrical.
○ If a system or a process (or an interaction) is asymmetrical, inverse asymmetry.
○ If a system or a process (or an interaction) is asymmetrical, increase the degree of asymmetry.
○ Change the degree of asymmetry by varying asymmetry dynamically depending on operating conditions.
○ Increase or decrease the degree of symmetry of a processes depending on the operating conditions and required effects.

❑ Increasing asymmetry in equity distribution during investment rounds.
❑ Relocating focus on learning customer's behavior in real environment rather than simulating it.
❑ Asymmetrical activities distribution based on the degree of competence of personnel.
❑ Introducing dynamically changing degree of asymmetry to a business process depending on varying business cycles.
❑ Budgeting for different departments individually rather than using a constant percentage increase or reduction for all department.
❑ More "customer" in supplier-customer relationship.
❑ Collaboration with "complementor" organizations.
❑ Honda's 4M: "Man Maximum - Machine Minimum" product design philosophy.
❑ Asymmetrically-shaped advertisement box catches more attention.
❑ Asymmetrical shape of an office desk adjusted to the required needs and comfort.
❑ Asymmetrical questionnaire: only relevant questions should be answered.
❑ Introducing asymmetry to displaying web page contents to catch attention.
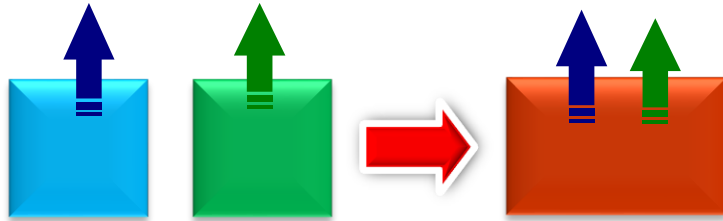
Strategies and recommendations

- ○ Merge identical (or similar) parts or components of a system in space.
- ○ Merge identical (or similar) parts or components of a system in time.
- ○ Merge two or more different systems to achieve synergetic effect.
- ○ Merge two or more systems to increase efficiency or to save space, time, energy or any other resources.
- ○ Merge two or more different processes in time or space.
- ○ Transfer activities from one process to another process.

- ❑ All kinds of smaller stores are merged within a shopping mall.
- ❑ Banks offer customers a full range of financial service packages - savings, mortgage, insurance, pension, etc.
- ❑ To operate on unknown territory, a joint venture is created between two companies providing similar services but in different countries.
- ❑ Exhibitions are often conducted at the same time together with the congresses.
- ❑ Several different companies create a common logistic center in another country.
- ❑ Cell-based manufacturing.
- ❑ Placing fiber optics internet cables inside existing water pipes in Tokyo removed the need for additional groundwork and saved space.
- ❑ iPod: merging digital music player and iTunes online service ensured market success.
- ❑ In dealing with capability shortfalls where two potential candidates are strong in some areas and weak in others, the decision is made to have the two candidates share the essential job functions.
- ❑ Using the same refrigerator truck to transport all sorts of frozen products from different vendors at once.
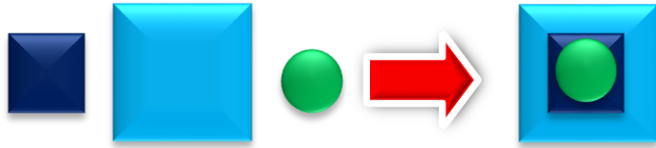
Strategies and recommendations

- If there are several components or systems delivering different functions, consider creating a new single component or a system that will deliver all these functions thus eliminating the need for having several different systems.
- If there are several separate different processes delivering different functions, consider creating a single process that will deliver multiple functionality.

❑ Hiring a person who combines technical and business education.

❑ Universal ATM machine working for many different banks.

❑ Ebay: auctioning everything.

❑ Universal call center.

❑ Company's cantina provides exposition of company products.

❑ Stadium that hosts both sport events and music performances.

❑ "Well-being store": a food supermarket that also offers dietary consultancy.

❑ Multi-skilled work force.

❑ "One-stop shopping": a gas station that sells fuel, insurances, banking services, food, etc.

❑ "Total Performance Scorecard™" which links many different parameters to measure and improve short and long-term potential of individuals and organizations.

❑ "Media Center PC": a computer that offers a range of audio-video functions in addition to standard functionality.

❑ Minivan seat that adjusts to accommodate seating, sleeping or carrying cargo.

Strategies and recommendations

- Place a system or its subsystem inside another system or a subsystem.
- Increase a number of systems/objects nested.
- Make one system dynamically become a part of another system when necessary and then separate the systems again.
- Introduce a new process inside of an existing process.
- Increase a number of "nested" processes.
- Make process activities dynamically appear when needed and disappear when not needed.

- Store-in-store.
- Profit centers inside an organization.
- Hierarchy of employee needs - Basic, Environment, Simple Individual, Complex Individual, Transcendent.
- Targeting at the customer's hierarchy of needs when launching a new product.
- Companies inside companies.
- "Nested" project teams.
- Networks within networks.
- Exposing traditionally inward facing job-holders to external events/customers.
- Nesting smaller events (e.g. workshops, roundtables) within bigger events (e.g. conferences).
- Different software modules with independent functionality within a single software package.
- Activities within activities.
- Instead of the overall quality check after a process is done, smaller quality checks are introduced after each activity.
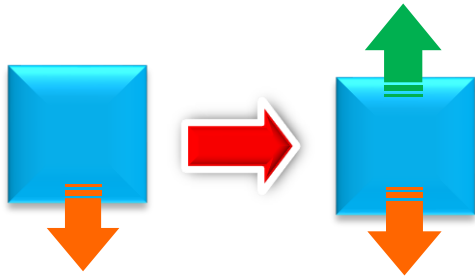
Strategies and recommendations

○ If a certain action by a system or a process causes a negative effect, but the action should be preserved, subject the system or the process to a "counterforce": a reverse action which cancels the negative effect.

○ Divide a system or a process to parts so that the undesired action that produces a negative effect and the desired action compensate for each other.

○ Change the environment of a system in such a way that the environment itself produces such "counter-" or "compensation" force.

○ Merge two systems or processes which deliver opposite functions (actions) together.

❑ Introducing persons with different, even opposite backgrounds to a discussion team ensures a multitude of opinions to reduce a chance for missing a critical opinion.

❑ "Provocative" questions during discussions often lead to new out-of-the-box ideas.

❑ Developing both positive and negative forecast scenarios helps to improve risk management.

❑ In a merger of two companies, one "lifts" the other with whatever its stronger features are (distribution system, marketing, methods, capital, etc).

❑ Companies increase flagging sales by making connections with other rising but different products (e.g. movie tie-ins).

❑ Leverage products in supermarkets compensate for low profit from other produces.

❑ A single company which provides construction and demolition services.

❑ A shop which sells and buys books.

❑ Hiring high and low-cost personnel instead of "average".

Strategies and recommendations

○ If a system or any its subsystem is subjected to a certain action which produces both negative and positive effects upon the system or its supersystem, consider subjecting the system (subsystem) to antipodal (inverse) action beforehand so that it will compensate or eliminate the negative effect when the negative effect occurs.

○ If a process is subjected to a certain action which produces both negative and positive effects upon the system or its supersystem, consider subjecting the process or its part to antipodal (inverse) action beforehand so that it will compensate or eliminate the negative effect when the negative effect occurs.

❑ Customer trials/segmented launch of (high risk) new products (e.g. movie studios film several endings to a movie and trial with different audiences before finalizing selection).

❑ Smartly organized "negative critics" can trigger interest to a newly launched product.

❑ Failure Mode and Effect Analysis (and similar techniques) help to prevent failures and accidents in future.

❑ Announcing possible negative effects before launching a high-risk activity.

❑ Anticipatory Failure Determination: instead of asking question "why something can go wrong" ask the question "how to make something go wrong".

❑ During customer's surveys asking what the customer would *not* like to see in a new product.

❑ Forcing employees to wear protective gear such as steel-toed shoes and safety glasses is an anti-action to avoid injury.

#10: PRIOR ACTION

Strategies and recommendations

- If a system, some its subsystem or process is expected to experience harmful influence of its supersystem, create preliminary conditions that will prevent the system or the process from influence of these harmful factors.
- If a system or process is going to be changed in a certain moment of time but such a change is difficult to achieve exactly when needed, perform the required change of the system/object (fully or partially) in advance.
- Pre-arrange different subsystems of your system or process activities in such a way that they can be "assembled" right where and when it becomes necessary but not before.
- If it is expected to be difficult to do some activities within a process, consider doing them in advance.

- ❏ Pre-sales and pre-marketing.
- ❏ Formation of the "expectation" effect.
- ❏ Sales of school articles at pre-school season.
- ❏ Corporate professionals have to be trained in advance in those skills that will be required according to the company long-term business strategy.
- ❏ Holding structure helps to prevent the intellectual property from bankruptcy.
- ❏ Announcing a meeting some time earlier than expected.
- ❏ An appropriate stimulus that motivates people to take a particular action might be more effective than a complicated system of control.
- ❏ Before introducing a radically new product to the market, create awareness of the product's value in the eyes of potential customers.
- ❏ Before introducing a new software to the market which works with databases, develop a sample reference database available online.
- ❏ Epson product development engineers spend time as sales and service staff before they are allowed to work on product development.
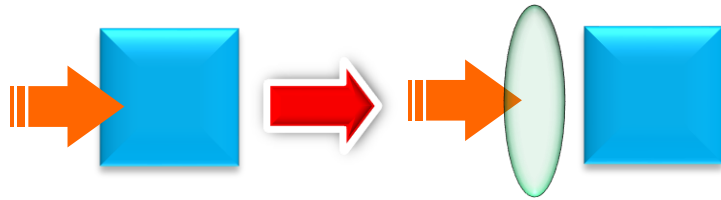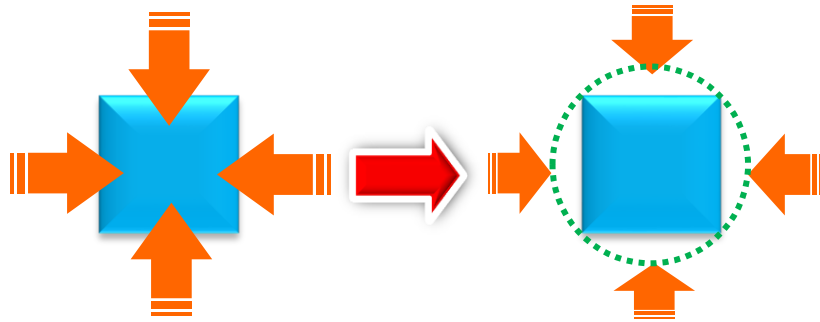
Strategies and recommendations

○ If you expect a specific negative effect to happen, create conditions in advance that will eliminate a chance for a negative effect to happen.

○ If you expect a specific negative effect to happen, create conditions in advance that will immediately fix the negative effect if it happens.

○ If you expect a specific negative effect to happen, create conditions in advance that will instantly compensate for the negative effect.

❑ Service facilities are established before a new product launch.
❑ Money back policies.
❑ Encouraging short, effective meetings by removing the chairs.
❑ Put clauses in contracts requiring arbitration/mediation to avoid litigation.
❑ Customer trials/segmented launch of high risk new products.
❑ Merchandise is magnetized to deter shoplifting.
❑ Risk management and contingency planning.
❑ Backing up information.
❑ Providing more information on a service than required to avoid misunderstanding.
❑ Introducing insurance of services.
❑ Detailed action planning.
❑ Displaying guiding and navigation systems at websites.
❑ Suggesting long-term contracts with suppliers.
❑ Explaining follow-ups to customers before launching service.

#12: TENSION REMOVAL

Strategies and recommendations

- ○ Create conditions to eliminate or compensate for possible tensions that occur or might occur within a system or between the system and its supersystem.
- ○ Create conditions to eliminate or compensate for possible tensions that occur or might occur within a process or between the process and its supersystem.
- ○ Integrate different subsystems or systems to remove tension.
- ○ Introduce a new subsystem or a process activity to decrease possible tension.
- ○ Eliminate or replace a subsystem or process activity that creates tension.
- ○ Break a process to smaller steps to remove possible tension.

- ❑ A manager tunes presentation to best suit audience of, for example, workers and directors.
- ❑ Making "horizontal" career changes to broaden skills.
- ❑ Trust building exercises.
- ❑ Increasing customer's loyalty by organizing customer groups meetings, events and supply of information.
- ❑ Team members distribute their own merit award money (rather than management).
- ❑ Force-Field Analysis: group discussion of the phrase "forces push in various directions" - teambuilding/problem-solving technique.
- ❑ Conducting job interview in a café rather than in the office.
- ❑ Online FAQs help to clarify many issues before engaging to a purchase.
- ❑ Ensuring equal handling of different customer groups.
- ❑ Hiring a third-party independent mediator for resolving conflicts.
- ❑ "Go/No Go" clauses in contracts.

#13: OTHER WAY ROUND

Strategies and recommendations

- ○ Instead of actions required consider performing antipodal (inverse) action to achieve the desired positive effect.
- ○ Consider replacing parts of a system with parts that have opposite (inverse) features: filled – hollow, black – white, and so on.
- ○ Reverse the order of actions/activities.
- ○ Make the non-dynamic part of a system dynamic or fix dynamic parts.
- ○ Turn your object/system upside down.
- ○ Invert the entire process or some of the steps of the process.

- ❑ Conduct training of customers at the customer's location instead of company-vendor location.
- ❑ Home-shopping and banking.
- ❑ Park-and-ride schemes in busy cities.
- ❑ Mobile car service - mechanic comes to you rather than you going to garage.
- ❑ Mobile library: books are delivered to your door.
- ❑ Advertisement "Rolls-Royse is the most expensive and non-economic car in the world" targeted at wealthy people.
- ❑ Advertisement of a new luxury house in Moscow: "You do not save by buying this house, you invest to your exclusivity".
- ❑ A classical way of sales is prepay, and then delivering the product. A concept of credits turns the process in reverse direction.
- ❑ Benchmarking against the worst instead of the best.
- ❑ A construction company provides demolition services.
- ❑ The USSR government paid inventors for filling patent applications to boost innovation.
- ❑ Sabotage approach helps to discover possible product or service failures before launching to the market.
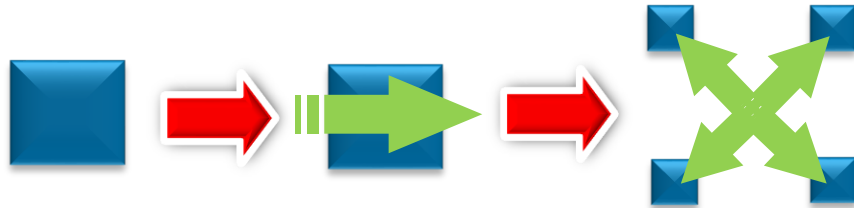
Strategies and recommendations

- ○ Instead of linear parts (subsystems) or a linear structure of a system, consider using "curved", "spherical" parts or systems, or non-linear structures.
- ○ Instead of linear processes use non-linear processes.
- ○ Sequel linear and non-linear activities within a process.
- ○ If a process is non-linear, consider increasing the degree of non-linearity.
- ○ Use circular flow instead of linear flow.
- ○ Use roundabout solutions in a process.

- ❑ Take the shortest path to the customer - around the organization rather than point-to-point through the bureaucracy.
- ❑ Rotating leadership in a team.
- ❑ Supermarkets that have circular rows instead of linear.
- ❑ Quality Circles.
- ❑ Segmentation and focusing on marketing spheres.
- ❑ Circular work cells.
- ❑ Circular reception desks.
- ❑ Introducing a circular path (loop) to a business process, like re-work.
- ❑ Optimizing recourses involved to a process according to non-linearity.
- ❑ Using 3D-spheres for explanations in presentations rather than 2D circles.
- ❑ Levi Strauss' IS Department's organizational chart resembles a solar system, with the names of 20 managers appearing once on a large circle-and in many cases, also on one of four smaller circles intersecting the large one. The small circles represent action groups focusing on specific tasks, including customer service and business systems.

Strategies and recommendations

- If your system is static and immobile, make it dynamic and movable.
- Divide a system into parts capable of movement relative to each other.
- Increase the degree of free motion within a system.
- Make a system (or its subsystem) or its supersystem dynamically change and adapt to be in accord with the required conditions at each stage of operation.
- Make the structure of a process more dynamic.
- Increase the degree of dynamics of those process activities that experience negative influence of supersystem, or which performance has to be increased.

- ❑ Flexible (fluid) organization structure versus old fixed hierarchical structures.
- ❑ Organizations traditionally viewed as "competitors" may become collaborators on certain projects.
- ❑ Rotation of employees inside of an organization.
- ❑ Mobile factory.
- ❑ Agile product development.
- ❑ Continuous Process Improvement.
- ❑ Life-long learning.
- ❑ Dynamically changing environment: moving working sessions to unusual places to avoid psychological inertia.
- ❑ Animated presentation instead of static.
- ❑ Dynamic relocation of investments in a portfolio.
- ❑ Dynamic adjustment of service offerings to each new customer.
- ❑ Gallery Furniture on-line shopping - customer is able to control and move cameras to point to different products in different parts of the store from his/her home computer.
- ❑ Revolving loans.

#16: SLIGHTLY LESS OR MORE

Strategies and recommendations

- ○ If it is not possible to precisely achieve the required change of a system or a process, or to achieve the desired goal in full, then reformulate the problem:
  - ○ How to make or deliver slightly less and then achieve the effect required.
  - ○ Make or deliver slightly more to achieve the effect required.

- ❑ Communicate more than you "have to".
- ❑ Aim to 'delight' rather than "satisfy" customers.
- ❑ If time does not allow presenting all the material during a training workshop, reduce the amount of shown material but teach it better; the remaining material can be given as notes to read afterwards.
- ❑ Offering a customer to pick up several electronic products in a store to test at home and then make a choice.
- ❑ If a certain process has some critical and risky step, increase the number of resources to ensure that the step will not fail.
- ❑ When selling a cheaper "green energy" explain consequences and value not only for customers but for environment as well.
- ❑ Going into a new market, do "saturation" advertising by all media--mail, newspapers, local magazines, local radio, local TV, billboards, etc.
- ❑ Discounts for services if booked in advance.
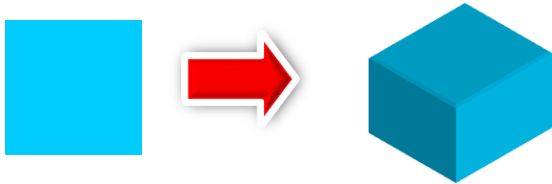
Strategies and recommendations

- ○ Use other dimensions in addition to already used ones in a system or a process.
- ○ Introduce a new dimension to a system, process or their supersystem.
- ○ Use a multi-layered arrangement instead of a single layer for a system or a process.
- ○ Tilt or re-orient a system or its subsystem in space.
- ○ Introduce viewing of a system or process under a different angle.

- ❑ Shifting from "line" to "project" management dominance in matrix organization (and vice-versa - depending on prevailing market conditions).
- ❑ Shifting from portrait to landscape report format.
- ❑ Introducing a new value-adding dimension to supplier/customer relationship.
- ❑ Multi-dimensional organization hierarchy charts - 3D (e.g. to show 'hard' and 'soft' relationships), or 4D - to include an element of time or movement.
- ❑ Using 3D-charts for explanations in presentations rather than 2D charts.
- ❑ Multi-stack storage systems use the height of a building, and save floor space.
- ❑ Horizontal (peer) communication.
- ❑ Viewing an organization from the outside - either directly or using consultants, "mystery shoppers", etc.
- ❑ Changing "thinking modes" (lateral thinking) during project discussions.
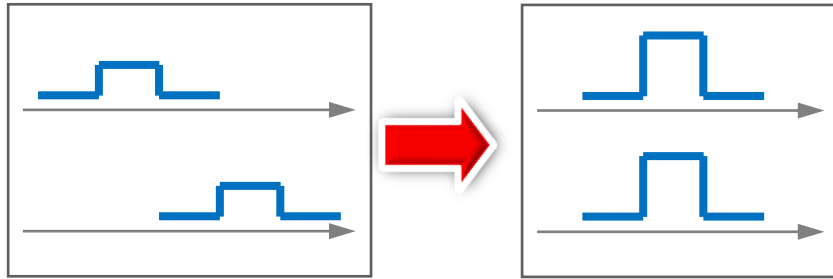
Strategies and recommendations

- ❍ Make a system "vibrate".
- ❍ Make actions produced by a system match the actions of another system to achieve optimal running or synergetic effect.
- ❍ Match the periodicity of the actions/activities produced by two different systems or processes.
- ❍ Match intervals of actions produced by two systems or processes.
- ❍ Match in space or in shape two systems that interact with each other.

- ❑ Advertisement of travel insurance packages during vacation seasons.
- ❑ Approaching a customer with an offer of a value-adding product service during purchasing the product.
- ❑ Using strategic planning (policy deployment, hoshin Kanri) to select the right frequency and get the organisation resonating at that frequency to accomplish a breakthrough strategy.
- ❑ Increasing supply of vacation products in stores during vacation times.
- ❑ Increasing a number of movies shown in theaters during weekends.
- ❑ Conducting tests in parallel with development.
- ❑ Combining education with work on the real projects (during education).
- ❑ Use the catchball process of hoshin planning to get the whole organisation "vibrating".
- ❑ Outside electronic advertisement board that changes its content depending on a period of a day or night.
- ❑ 'Kansei' - Japanese term for resonance/one-ness between product and user.

#19: PERIODIC ACTION

Strategies and recommendations

- ❍ Instead of continuous process use periodic, "pulsed" actions.
- ❍ Introduce diversification among time intervals between the actions depending on operating conditions or changes in the supersystem.
- ❍ Dynamically vary periodicity of process actions according the operating conditions or changes in the system or supersystem.
- ❍ Use available pauses between process actions to perform some other useful process action(s).

- ❑ Newsletters help to get timely information and not to forget about a vendor.
- ❑ Instead of performing a task continually, determine the time boundaries and perform that task periodically.
- ❑ Increasing time per patient in private clinics helps to reveal more problems and thus rise the revenues.
- ❑ Tidal traffic flow schemes ease transport into and out of busy areas
- ❑ Auditing at irregular intervals.
- ❑ Flexible savings schemes which pay higher interest rates the fewer the number of withdrawals made.
- ❑ 24-hour car service operation - evening pick-up, return of serviced car by breakfast the following morning.
- ❑ Performing maintenance work during vacation periods.
- ❑ Hiring a person for one day a week.
- ❑ A warning lamp flashes so that it is even more noticeable than when continuously lit.

Strategies and recommendations

○ Make all processes in a system work continuously.
○ Eliminate all idle running from a process.
○ If it is not possible to avoid idle pauses in a process, consider filling them with some other positive process activities.

❑ Continuous online monitoring of elevators by Otis - total maintenance responsibility.
❑ 24-hour car service operation - evening pick-up, return of serviced car by breakfast the following morning (garage perspective).
❑ 24/7 hotlines.
❑ Using coffee breaks to discuss and solve existing problems or propose new ideas.
❑ "Hot-till"ing in supermarkets - staff do other tasks during quiet periods; move to tills when they see queues developing.
❑ Access to the Internet in trains and airplanes.
❑ Lifetime learning philosophy.
❑ Wi-fi and Wi-Max: non-stop internet access.
❑ "Revolving credits" by Visa and Mastercard.
❑ 24/7 business facilities in hotels.
❑ Online sale systems working 24/7.
❑ Using public transportation to be able to continue working.
❑ Multitasking computer operating systems.

#21: HIGH SPEED

Strategies and recommendations

○ If a system is subjected to harmful or hazardous actions within some process, perform the whole process at very high speed.

○ If a process experiences harmful effects caused by the supersystem, reduce time of interacting with the supersystem as much as possible.

○ If it is difficult to perform some change of a system due to emergence of negative effects during the process of change, perform the required change at very high speed.

○ In case if a negative effect emerges in a process, locate which activity is responsible for the negative effect and perform it at very high speed.

❑ Getting through painful restructuring processes very quickly.

❑ "Fast Cycle - Full Participation" - method of involving the whole organization simultaneously and rapidly in a major change, such as a re-organization.

❑ Rapid prototyping to evaluate before making a decision.

❑ Fast benchmarking to reveal and focus on most critical issues.

❑ Very short interview including problem solving to evaluate intuitive skills of a person.

❑ Fast learning instead of long-term classes.

❑ "Fast and dirty" new product prototype development focusing on its core functions only to study customer's reaction as soon as possible.

❑ A knife for thin plastic tubes prevents tube deformation during cutting by running at a very high speed (i.e. cuts before the tube has a chance to deform).

#22: BLESSING IN DISGUISE
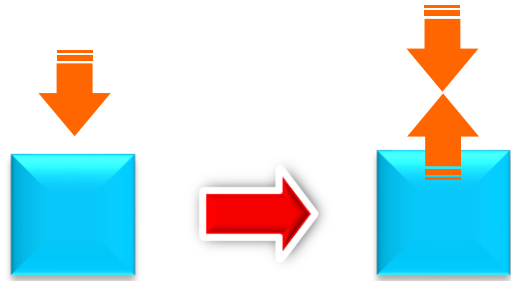
Strategies and recommendations

- Use harmful factors or negative effects that emerge in a system, a process, or in their supersystem to achieve positive results.
- Eliminate a specific harmful factor by adding it with another specific harmful factor.
- Amplify the harmful factor to such degree so that it would stop bringing harm to a system or its supersystem.
- Consider how to convert a harmful factor to a value adding factor.

❑ Put a "problem" person on an assignment in another area where he/she can do well and not be a problem to the original group.
❑ Eliminate fear of change by introducing fear of competition.
❑ Gather customer complains to improve products.
❑ "Provocations" method of encouraging new ideas.
❑ Eliminating fear of change by introducing fear of competition.
❑ If goods cannot be supplied timely, restrict supply of the goods even more to create scarcity value.
❑ Keep traffic out of cities by introducing cheap transfer points and expensive downtown parking charges.
❑ "If you want to succeed, double your failure rate", JR Watson, IBM founder.
❑ Intentionally made (funny) spelling errors at web pages catch attention of readers.
❑ Use exhaust heat of manufacturing to produce electricity.
❑ Use existing negative feedback to create trust with your future customers.
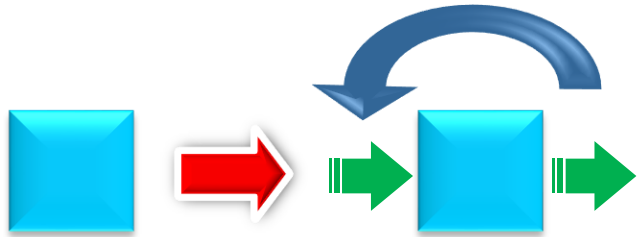
Strategies and recommendations

○ Introduce feedback within a system or between the system and its supersystem.

○ If the feedback is available but is not effective enough, then consider making it dynamic by varying the feedback components and structure in accord with operating conditions.

○ If it is known that a negative effect can occur, consider creating conditions that can initiate a negative feedback loop directed toward eliminating this negative effect or reducing its harmful consequences.

○ Increase the magnitude and scale of the existing feedback.

❑ Statistical Process Control (SPC): Measurements and statistical analysis are used to decide when and where to improve a process.

❑ Customer electronics bulletin boards.

❑ Customer surveys.

❑ Co-evolutionary marketing together with customers (by Amazon.com).

❑ Automatic tracking Internet systems that provide information about customers.

❑ Introducing new non-profitable services which help to motivate customers to provide feedback.

❑ RFID tagging for tracking product displacements.

❑ Intensifying customer feedback by offering incentives for suggestions.

❑ Blogging helps companies to get feedback from the readers.

❑ U.S. has instituted the following environment monitoring system: each territory has a limit pertaining to the release of hazardous elements from all companies in that territory. Therefore, to stay within the limit, companies monitor each other.

Strategies and recommendations

❍ Use an intermediate carrier to provide necessary functionality or to eliminate negative effects while preserving positive functionality.

❍ Check if some available resource can act as intermediary object.

❍ Temporarily merge an object /system with a foreign object/system that will provide the required action and then, if necessary, remove (eliminate) the foreign system/object.

❍ Temporarily merge a process with a foreign process that will provide the required action.

❍ Introduce a new intermediary object/system which is a modification of the first or the second object (system) if a problem emerges from the interaction between the two systems. Modification should be understood in a broad sense: it can be material, property, energy, or any other type of modification.

❑ Companies hire famous people and celebrities to advertise mass products.

❑ Companies which develop products use other companies – distributors of their products who already have customer bases.

❑ Companies hire external consultants who can deliver special skills unavailable at the companies.

❑ Franchisee acts as intermediary between corporate vision and customer.

❑ Selling software preinstalled on computers.

❑ KLM "feeder" airline concept - short flights from Germany, England pull passengers away from national airlines to fly long distances using Holland as a hub.

❑ Hiring an external facilitator for dispute resolution between two companies.

❑ Hiring temporary external personnel during peak periods.

❑ To improve communications with a supplier, a company establishes a new company with personnel of both the company and supplier which provides an interface.

❑ Making a customer "happy" turns him to an advertiser of a service or a product.

❑ Using an existing online payment system instead of developing own system.

Strategies and recommendations

- ❍ A system or its subsystem must serve itself by performing tuning, adjusting and repair operations all by itself.
- ❍ Use available resources or waste resources within a system to achieve the required degree of self-service.
- ❍ Use available resources or waste resources within supersystem of a system to achieve the desired degree of self-service.
- ❍ Consider using already available activities in a process to service other activities.

- ❑ Quality circles.
- ❑ Biodegradable packaging.
- ❑ Brand image circularity: Harvard Business School produces bright people; these people enhance the School's reputation; hence lots of people apply; hence they only take on very bright people; bright people in equals bright people out; and so the circle re-enforces itself.
- ❑ Re-hiring retired workers when their experience is needed.
- ❑ Providing customers with price discounts if the customers return product surveys.
- ❑ "Industrial eco-systems": e.g. factories where waste heat from one operation provides power for another operation, water is reused in different processes, etc.
- ❑ Instead of finding an external system to provide the needed function, first checking if some already available resource can deliver the function.
- ❑ Online software updates: checking for updates online and once a new update is found, updating installed software automatically.

Strategies and recommendations

○ If you need to undertake certain actions that can damage to fragile or expensive system or subsystem, use its simpler and cheaper copy.

○ If you need to undertake certain actions with respect to unavailable, complex, expensive or dangerous system or subsystem, use its copy.

○ If a process required is too complex and risky, use simplified version of the process to run experiments.

○ Instead of real physical systems/objects, use their "virtual" images (images, holograms).

○ Use virtual models of your systems.

○ Before launching a complex process, experiment with its simpler "copies".

❑ Rapid prototyping of business processes; simulation business models.

❑ Numerical simulation - operational analysis (virtual business development, strategic planning modeling).

❑ Studying customer reactions by using models of products (or mockups) instead of the products.

❑ Modeling of business processes helps to reveal inconsistencies in the process.

❑ Modeling customer's behavior helps to build possible scenarios of market evolution.

❑ Functional enterprise modeling helps to reveal potential resources for new services.

❑ "Disposable organization structures" in rapidly changing markets.

❑ Flight simulator reduces pilot training costs.

❑ The height of tall objects can be determined by measuring their shadows.

❑ Inflatable full-size model of a tram to show it in another country.

Strategies and recommendations

- ⚪ Replace an expensive system or a subsystem with a multitude of cheap ones.
- ⚪ Instead of long continuous and expensive process, break the process to a number of short-term inexpensive activities.

❑ "Disposable organization structures" in rapidly changing markets - e.g. little point in massively optimizing structures in e-commerce businesses which are still in a state of rapid evolution.

❑ Swatch "renewed impulse" buying - "Changing clothes? Change Swatch".

❑ Throw-away cameras, mobile phones, etc.

❑ Disposable diapers, spoons, cups, etc.

❑ Many cheap smaller advertisements rather than single expensive one.

❑ Hiring students to make work which does not require full qualification.

❑ Break a single long creativity session to a number of short ones to achieve more effectiveness.

❑ Rather than developing a full application out of a prototype causing expensive cost overruns, use rapid prototypes which are built as quickly as possible and implement only requirements that are poorly understood, to learn which alleged requirements are real and which are not.

#28: PRINCIPLE REPLACEMENT

Strategies and recommendations

- ○ If a system or some its subsystem cannot deliver its function with the required degree of performance, consider replacing the operating principle (business model) with a new operating principle which will provide function delivery with performance required.
- ○ Check if it is possible to replace a basic operating principle behind a system, its subsystem or a process without replacing the system, the subsystem or the process.
- ○ Add a new subsystem to a system or new activity to your process that will deliver the required functionality based on a new principle.
- ○ Check if a system, a process or their supersystem already have a resource based on the required new principle and use it to achieve the needed functionality.

- ❑ Electronic voting.
- ❑ Plastic debit card instead of banknotes.
- ❑ Using smartphone for payments.
- ❑ Multimedia presentations.
- ❑ Involving product R&D specialists to marketing sessions to find new opinions and ideas.
- ❑ Learning performed not in a classroom, but directly at a shop floor.
- ❑ Trouble tickets instead of phone communication.
- ❑ Using a mobile device for remote checks and wireless transmission of gathered information instead of paper notes.
- ❑ 3M: Asking customers to propose innovative changes of your product.
- ❑ "CEO replacement": simulation of new strategic decision making by assigning a function of CEO to other board members.
- ❑ Voice recognition alleviates the mechanical action of typing and mistyping and then backspacing.

Strategies and recommendations

○ Increase "fluidity" in a system or a process by introducing continuous "flows": information, communication, experience and expertise exchange, etc.

○ Establish or increase a number of flows between a system and its supersystem.

○ Make some subsystems of a system to be able to "flow" throughout the system.

○ Fluidity can be achieved by multitude of smaller "non"-fluid objects acting together in a "fluid" way.

○ Make a system flexible to work efficiently under different requirements.

○ Increase flexibility of a process or its specific activities.

❑ "Fuzzy logic" versus "rock logic" during decision making.

❑ Organizations traditionally viewed as 'competitors' may become collaborators on certain projects - this is happening increasingly in the aerospace industry; which now has a much more fluid approach to who works with whom.

❑ Sharing experts among several business units.

❑ Flexible working hours.

❑ Organizing essential information flows throughout the entire business organization.

❑ Establishing a "fluid" communication flow with a customer.

❑ Establishing multiple communication channels to let information flow directly to the needed point in an organization.

❑ Quickly adaptable and adjustable service structure to the changing needs of a customer.

Strategies and recommendations

- Introduce "thin layers" to isolate a system or its subsystem from its supersystem.
- Instead of impairing a feature to a whole system, impair the feature to its interface layer only.
- Use flexible thin layers as "coating" to add the required functions or properties to your objects or a system.
- Instead of complex and massive three-dimensional physical structures use flexible shells and thin structures that can be hollow inside.
- Introduce "thin barriers" to separate between process activities.

- Getting faster customer service by having the single employee customer service agent have all the necessary data easily available, so the customer only deals with the single, flexible 'shell' of the organization not the whole bulky volume.
- Card transactions instead of money - e.g. vending machines in companies use employee ID card and charges are debited direct from salary.
- Office workers in open areas can use flexible curtains to shut themselves off from the visual chaos of the open area when they need to concentrate rather than communicate.
- Using 'trade secret' methods to separate company proprietary knowledge from general knowledge.
- For shipping fragile products, air bubble envelopes or foam-like materials are used.

#31: HOLES AND NETWORKS	EXAMPLES

Strategies and recommendations

- Make a system or its subsystem "porous" by introducing "holes".
- If a system is "porous", fill the "pores" with other subsystems to deliver different functions or to achieve the desired results.
- Impart network structure to a system.
- Introduce "filtering membranes" to diminish the influence of harmful factors of supersystem or other subsystems.
- Introduce breaks in a process which can be filled with different content.

❑ Consider a customer as a possible partner in the future.
❑ A customer-facing layer of a company which acts as a filter of the information flow both into and out of the organization.
❑ Rather than isolating suppliers from each other let them communicate with each other.
❑ Create a network of your customers and let them communicate independently from you.
❑ Internal communications can be improved by creating Intranet accessible by all hierarchical layers; give all employees access to CEO and vice-versa.
❑ Matrix organizations.
❑ An intelligent tutoring system. It needs to be "porous" and intentionally make mistakes to play down to the level of a student.
❑ Companies like 3M, Google, and some others allow employees spending 15-25% of their working time on personal projects each week.

#32: VISIBILITY AND COLOR CHANGE	EXAMPLES
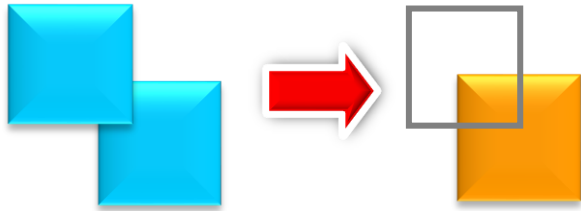
Strategies and recommendations

- ○ Change the visibility degree of different parts of a system respectively to another subsystem or supersystem.
- ○ Change color of a system or subsystem, or supersystem if possible.
- ○ Use different colors to highlight different parts or different functions.
- ○ Change transparency of a system or its subsystem, or its supersystem if possible.
- ○ Make a process or its part as transparent as possible.
- ○ Highlight the distinguishing property of a subsystem/system/process.

- ❑ 'Transparent' organizations.
- ❑ Ensuring that every employee gets access to CEO if needed.
- ❑ Transparency of a a delivery process for a customer.
- ❑ Tracking functions within delivery process.
- ❑ "Transparent" process steps: that can be skipped depending on conditions.
- ❑ Using different colors in diagrams.
- ❑ "Six thinking hats" approach by De Bono to identify different roles within thinking processes.
- ❑ Using different colors in airports to identify different classes (coach, business, etc); or different types of signs.
- ❑ Dynamically exposing or hiding certain functionality of a business system.
- ❑ Using different colors within web-based collaborative software to attract attention to changed conditions.
- ❑ Using different colors to use different customer's associations
- ❑ Semi-transparent items which are not available in a menu of a computer program.
- ❑ Putting special focus on a new function or a competitive advantage.

#33: HOMOGENITY	EXAMPLES
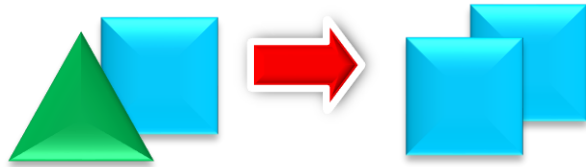
Strategies and recommendations

- ○ Impair interacting objects or parts of a system the same structure with similar or identical properties.
- ○ Compose a system from a number of homogeneous objects.
- ○ Make some parts of a system homogeneous with your supersystem.
- ○ Make some parts of a process which interact with supersystem homogeneous with supersystem.

- ❑ Co-located project teams.
- ❑ Product families.
- ❑ Boeing "Working Together Teams": bringing customers and suppliers into design loop.
- ❑ Congresses that bring together people with similar competencies.
- ❑ Making customer literate in your way of doing things.
- ❑ Teaching suppliers in your area of operation to better understand your business.
- ❑ Bringing lead users to the product/process design team.
- ❑ Bringing a company's expert to the customer's location to act as a customer.
- ❑ Making a sales area in a store that sells furniture look like a living room.
- ❑ Selling toys not in a standard designed store but in playground sections.
- ❑ Teaching all employees in all core aspects of company's activities.
- ❑ Business incubators that provide homogeneous environment enabling cooperation.
- ❑ Interacting people on the interface of process stage gates are with similar skills and background.

40 INVENTIVE PRINCIPLES: BUSINESS AND MANAGEMENT

#34: DISCARD AND RECOVER
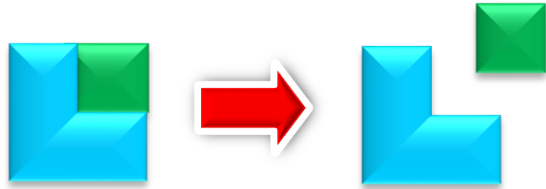
Strategies and recommendations

- If a system has to include some subsystem which only operates at a certain moment of time, consider introducing this subsystem only when necessary and then remove it.
- Consider if an activity is needed each time when a process runs. If not, make this activity only be included to the process when needed.
- If a subsystem of a system which fulfilled its function became unnecessary or produces negative effect, eliminate or modify this subsystem so that it will stop producing negative effect.
- Add subsystems to a system which will automatically eliminate those parts of the system which became unnecessary.
- Restore consumable subsystems of a system during operation.

EXAMPLES

- ❑ Flexible, variable-sized project teams.
- ❑ Load/capacity balance using contract labor.
- ❑ Hiring external consultants.
- ❑ Interim management.
- ❑ Outsourcing catering service.
- ❑ Mobile shops.
- ❑ Off-shore development.
- ❑ Choosing temporary business partners for specific events.
- ❑ Periodically re-energizing continuous improvement initiatives ('enthusiasm injections').
- ❑ Attract retired workers temporarily to balance workload.
- ❑ Dynamically appearing and disappearing activities within a business process.
- ❑ Leasing equipment instead of purchasing.
- ❑ Offering insurance contract which can be configured by throwing away or adding parts.
- ❑ A training program composed of modules which can be discarded or added depending on the needs.
- ❑ Keeping a pool of job candidates to quickly hire a new employee if someone leaves.

40 INVENTIVE PRINCIPLES: BUSINESS AND MANAGEMENT

#35: PARAMETER CHANGE

Strategies and recommendations

- Vary parameters of a system or a process adaptively.
- Instead of developing a new expensive system or a process search already available resource which can serve as already partly developed system or process.
- Change the degree of flexibility of a system.
- Change a system or its subsystem state when necessary.
- Instead of expensive objects use virtual copies, models, cheap objects, and vice versa.
- Change concentration or consistency of a system/subsystem.
- Change emotional parameters.
- Change visual parameters.
- Change other sensory parameters.

- ❑ Increasing or decreasing size of a project team depending on the project stage and conditions.
- ❑ Instead of developing a new internet system enabling cheap long-distance mobile phone calls, the existing system for internet phone calls (e.g. Skype) is used as a platform. A new system builds a mobile interface to Skype.
- ❑ Virtual prototyping.
- ❑ Introducing intelligence over already existing on-line catalogues (e.g. first generation catalogues were replicas of previous paper versions, latest generation incorporate search engines, expert systems, etc).
- ❑ "Heating up" a market before introducing a new product.
- ❑ Supermarkets pump bakery odors around the store to help advertise bread products.
- ❑ Changing environment for conducting problem-solving sessions.
- ❑ "Pressure cooker" sessions.
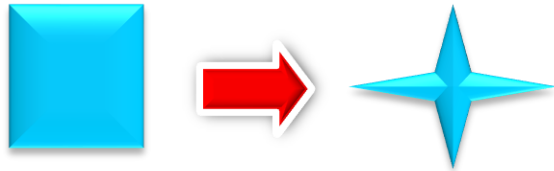
| #36: PARADIGM SHIFT	EXAMPLES
	❑ Dynamically adapting a consulting business to respond to market changes: consulting on downsizing during crisis, and on growth during booming.
	❑ Using macro-changes to implement business restructuring.
	❑ Continuously tracking and adapting to macro-changes in your area.
Strategies and recommendations	❑ Establishing joint ventures within emerging markets.
○ Use phenomena occurring at macro-scale in the supersystem to shift paradigms within a system.	❑ Forming/storming/norming/performing phases of team development – e.g. taking advantage of enthusiasm dip during storming-norming.
○ Use external "push" factors to achieve necessary changes in a system or a process.	❑ Placing an innovation team to extreme conditions which demand changing existing practices.
○ Create internal "push" factors to achieve necessary changes in a system or a process.	❑ Awareness of different requirements of different stages of a project or a business: conception, birth, development, maturity, retirement (e.g. shifting manpower requirements, shifting budget requirements).

#37: RELATIVE CHANGE

Strategies and recommendations

- ○ Use already existing differences between different components of a system to achieve positive effects.
- ○ Use dynamic "expansion-contraction" effects.
- ○ Merge two subsystems of a system with similar parameters/properties to achieve synergy.
- ○ Increase or decrease time of a certain activity in a process.
- ○ Flexibly change resources allocation between different process activities.
- ○ Use ongoing changes in a supersystem to achieve positive effects or modify a system/process.

EXAMPLES

- ❑ Expanding or contracting marketing efforts depending on the product's rate of sales and profitability.
- ❑ Combination of high risk and high-stability investment strategies during market turbulence.
- ❑ Merging different skills and competencies of employees to create temporary cross-functional teams.
- ❑ If employees are excited ("hot") each can do more in the space that expands to exist between them.
- ❑ Using different consumer preferences to create personalized products and solutions.
- ❑ A consulting company offers a specific service to a client "just in time" depending on a current client's focus and priorities.
- ❑ Expanding a business unit with temporarily hired seasoned workers when necessary.
- ❑ Temporarily joining forces with a competitor to get access to a large customer company.

#38: ENRICHED ENVIRONMENT	EXAMPLES
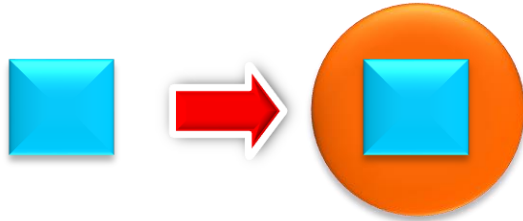
Strategies and recommendations

- ❍ Create an "enriched" environment for a system by bringing such component(s) to the environment that will boost the system's performance or help to achieve the desired effects.
- ❍ Conduct required processes or activities within 'enriched" environment.
- ❍ Modify the existing components of a system's environment in a such a way that this will boost your system's performance or help to achieve the desired effects.

- ❑ Guest speakers at a seminar.
- ❑ Using simulations/games instead of lecture-style training.
- ❑ Independent experts/facilitators during negotiations.
- ❑ Risk and Revenue Sharing partnerships.
- ❑ Visual exhibition in a training room.
- ❑ TV panels providing information or advertisement in a waiting room.
- ❑ External experts are invited to internal roundtable discussions.
- ❑ Targeting product marketing efforts at a market segment that already has awareness of the benefits of the product.
- ❑ Internal subject-matter experts.
- ❑ Music playing in CD/DVD-selling stores.
- ❑ Supermarkets pump bakery odors around the store to help advertise bread products.
- ❑ Open kitchens in restaurants.
- ❑ Product demonstrations in real environments.
- ❑ Online shops provide customers with videos how their products can be used.
- ❑ Engineering offices located to oversee production floor.

#39: INERT ENVIRONMENT

EXAMPLES
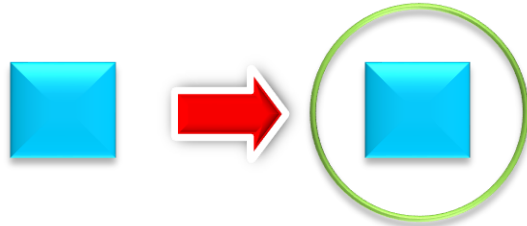
Strategies and recommendations

- ○ Replace existing environment outside a system (or its subsystem) with inert one.
- ○ Place a system (or subsystem) to "vacuumed" environment.
- ○ Isolate a system or a process from its environment.
- ○ If possible, remove those components from a system's environment that produce negative effects upon functioning of your system.
- ○ Add "neutral" parts to a system or a process.
- ○ Introduce pauses or breaks to a process.
- ○ Increase gaps between activities.

- ❑ Moving away from the (normal) disruptive performance appraisal, merit award, and reward environment to an (emotionally neutral) more fair system of working practice.
- ❑ Use of neutral third parties during difficult negotiations.
- ❑ Time-out during negotiations.
- ❑ Sound insulation of certain department store segments (selling arts, etc).
- ❑ "Networking" breaks during conferences, symposia, etc.
- ❑ Adding plenty of empty space around a product presented at exhibition to attract attention to the product and isolate it from other products.
- ❑ Moving mission-critical part of a development team to the area isolated from "noise" of usual environment.
- ❑ Adding pauses to the development process to correct possible errors.
- ❑ To prevent cotton from catching fire in a warehouse, it is treated with inert gas while being transported to the storage area.

#40: COMPOSITE STRUCTURES	EXAMPLES

Strategies and recommendations

- ○ Create a composite system consisting of several systems or objects with different or "biased" parameters or properties instead of uniform parameters of properties.
- ○ Create a composite system from systems or objects with opposite properties.
- ○ Create combinations of different functions, skills and capabilities.
- ○ Combine two or more different processes or activities.

- ❑ Multi-disciplinary project teams.
- ❑ Using multimedia for product demonstrations.
- ❑ Blended training which is a combination of e-learning, video lectures, classroom practice, etc.
- ❑ Employ different personality types (e.g. Myers-Briggs) on a team.
- ❑ Hard person/soft person negotiating team.
- ❑ Reinforcing development efforts by involving trainees.
- ❑ Multi-cultural creative teams.
- ❑ Combined high/low risk investment strategies.
- ❑ Co-branding and co-promoting.
- ❑ Customer-led innovation.
- ❑ Involving lead users to a development process.
- ❑ "Research and Marketing" department instead of separate R&D and marketing departments.
- ❑ Joint ventures.
- ❑ "Networks of networks".
- ❑ Providing training combined with work on real project.
- ❑ Combining development and testing to the same process.
- ❑ Lunch presentations.