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Innovation: A Cook Book Approach
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by Jay Doblin

Editor’s note: A world renowned industrial designer, Jay Doblin ran some of the largest and most influential design agencies of the mid twentieth century. He worked with clients including Shell, Coca Cola and BP, legendarily developed the corporate identity program for J.C. Penney and as the director of the Institute of Design at IIT, he was a dedicated and influential educator. Jay wrote this article in 1978 to outline some of the most important qualities necessary for successful innovation. It provides a wonderful insight into the prescient thinking that led him to form our company, Doblin, in 1981. Given its age, the piece stands up amazingly well and many of Jay’s ingredients are still critical to the innovation process today.

Innovation, a natural human activity, brings new products into being and refines them into better products. Once a product is invented, its innovation is continuous. Because no product is perfect, there are three levels of innovation: alteration; improvement; and invention.

Alteration (change for change’s sake) intentionally causes some product difference that may or may not improve performance. For example, if all current hairdryers have handles, then to stimulate interest, produce a new model without a handle.

Improvement is to find and fix some deficiency in a product’s performance, some technical or human factor. Kodak’s drop-in film cartridge was a well calculated product improvement.

Invention is dramatic innovation that starts or changes an entire field. Polaroid and Xerox are post-war inventions that deserve the rewards of commercial success and patent protection.

Alteration, improvement or invention can be done with genius or inanity. Alteration can be excellent though it’s usually mundane; invention is not always good, thousands of idiotic inventions have been patented.

Although it may seem so to those who haven’t practiced it, almost everyone, under proper conditions can be innovative. To foster innovation, make it clear that everyone involved must be innovative; that innovation is not mysterious, and with application they will succeed; and that with that an attitude of assurance, and with sufficient time and effort, products can be invented and improved.

During innovation, leaders must not become experts or judges; leaders must be as ignorant of the solution as are the producers. Leaders must prevent the producers from becoming blocked; if solutions don’t come, shift to “ice breakers” to keep the project going. One way is to make detailed drawings of similar products to learn how they work and how they are made; another is to use the product until its deficiencies become obvious; another is to get out and talk to or observe users; another is to use a cook book of innovation techniques.

COOK BOOK OF INNOVATION

Going to extremes will loosen inhibitions. Since table radios are almost always plastic or wood boxes, make the smallest possible radio, the largest possible radio, the flattest possible radio, the tallest and thinnest possible radio, the most mechanical radio, the cheapest radio, the most boudoir looking radio, etc. Look at other products such as luggage, furniture, automobiles, military equipment, clothing, jewelry, etc.

SWITCH FORMS AND MATERIALS
Materials, structure, color, manufacturing process, etc. can be arbitrarily changed to innovate. If table radios are box-shaped, try a cylinder, cone, tetrahedron, sphere, plinth, etc. If radios are plastic, consider carpeting, perforated metal, glass, fur, lace, rubber, basketry, denim, ceramic, etc. If they are all mold, try folding up cardboard, extruding aluminum, casting metal, firing clay, etc.

SWITCH STRUCTURES

An innovator can switch the “put together” of the product. Every product must be either a monolith, module, component, or cartridge. A monolith is a complete product that is substantially finished on all sides. Animals are monolithic, as are automobiles, airplanes, typewriters, and almost all products. Many products are modular, designed to stack, nest, or attach together to form a larger product. Furniture is often modular as are railroad cars that fit together end to end to form a train. A component is most of a product that must be assembled to a mating product to operate. An electric mixer that has a juicer, blender, meat grinder, knife sharpener, as “add on” components. The cartridge is a minor product that is usually replaceable in a monolithic product so as to keep the product operating. The “cartridge” in a rifle is replaceable and expendable as are razor blades, batteries, light bulbs, tires, film packs, tape cassettes, slide trays, etc. Innovation may occur if the concept of the product is switched from one category to another.

UNIVERSALITIES — PECULIARITIES

Every product shares universalities with all other products of its type; it also has peculiarities that distinguish it from all others. For example, Salem Cigarettes’ universalities include: tissue paper wrapped tobacco filled cylinders, which one must set on fire and then suck on, in a paper package of 20. Their peculiarities are mentholated, strong, filtered products. Innovation can focus on listing then switching universalities to peculiarities: for example, wrap them in perforated foil. The problem is to identify universalities; they’re too obvious.

Universalities in mattresses are: they’re all flat, soft, horizontal rectilinear planes with cloth surfaces. All of them use sheets, covers, pillows; all of them are one resiliency. Peculiarities include size (single, twin, double, etc.), construction (springs, foam, water, etc.). Why not make air filled, variable firmness, triangular, fur-covered, contoured (with an integral pillow) mattresses?

GOOD–BAD LISTS

Listing the good and bad properties of a product can trigger ideas. The hard part is to list the most obvious characteristics which are taken for granted.

Here is a list of some goods and bads of a light bulb:

Some good characteristics are: Bulbs are inexpensive; they sell in billions; light output is variable with rheostat; color is a warm full spectrum; they can be made in various intensities and colors; they’re silent, odor-free, fairly sturdy, etc. Some bad characteristics are: They glare if not shaded; burn out; a spare may not always be readily available; there must be wires feeding power; sockets must be standardized; a switch is required to turn it on and off; they emit more heat than light and may need ventilation, etc.

Once the list has been developed the designer can try to fix each deficiency and improve every advantage. If only one item triggers an improvement, the effort was worth it. Producing such a list also familiarizes the designer with the product.

THINK LIKE THE PRODUCT

An effective way to loosen the mind is to put yourself in the role of the product and imagine how you would feel or act if you were doing the work of that product. Einstein reported that he tried to think like a ray of light or a particle of matter so as to determine how they acted. Only after he had visualized how they might behave did he attempt to convert this concept into mathematical statements. Try to feel how a vise holds a metal rod. This technique not only opens mental doors, it simultaneously trains one’s visual powers to be more flexible and coherent.

SWITCH CONTEXTS

John Arnold taught innovation at MIT by inventing a planet called Arcturus 4 which had very strong gravity, a surface like mud, spherical people, and superstrong materials. His students
designed vehicles and other equipment for this weird environment to free them from the mental constraints of our familiar world. Switch contexts to destabilize mental set.

SEMANTIC DEFINITIONS

Consciously switching the semantic description of a product produces new ideas. The word “chair” can cause a mental block by describing a platform 18 inches off the floor with four legs and a back. Changing the product description to “body support” can cause the designer to envision a column of air, a ball of foam, a stick strapped to the back, etc.

By deliberately raising the names of parts of the product to the conscious level, analogies of the parts can be substituted. For examples, toothpaste tube was redefined: the cap as a valve; the body as a pump. Then all possible combinations of various valves and pumps could be tried to innovate a new package.

Since a product’s operation can be summed up in a word or two — dining table, easy chair, ball pen, floor lamp, etc — then why not reverse the process by using words to innovate new products? Willard Doyle uses the computer to combine lists of appropriately selected names, prefixes, suffixes, etc. to generate product descriptions (auto-polishing brush, auto-polishing stick, auto-polishing ball, auto-polishing paper, etc.)

HAND TO POWER TO AUTOMATION

One of the most basic trends is for products to go from hand to power to automatic. The first step is to invent the original hand-powered product which is usually an oscillating device. Since human power oscillates (a limitation imposed by the way the body is jointed) first attempts such as pounding grain, rowing and sawing are oscillating. In an intermediate first stage, human-powered devices use the crank to convert oscillation to rotation — the bicycle and bit brace are examples.

The second step is to insert mechanical power between the operator and the work. Grain pounding became wind or water mills; rowing became the steam powered paddle wheel; hand sawing became the electric arbor saw, etc. Powering a hand operation improves the speed, endurance and skill of the operator.

The third step, automate the control of the product, removes the tedium and fallibility of human operation. Many household products have been automated — heating systems, water heaters, dishwashers, toasters, clothes washers, oven temperature, alarm clocks, refrigeration, etc. Switch oscillating hand tools to rotary, hand to powered, powered to automated, or reverse the process to innovate.

DESIGN FOR SOME SPECIFIC USER

Another approach to mental set breaking is to forget the mass public for whom products are usually conceived and design the product for yourself. Put everything in it that you, personally, would like if you had your way. Another mental set breaker is to design the product as a competitor might who wanted to hurt you. I did this once to intentionally try to arouse a client; he nearly had apoplexy until he realized the truth; but once he did, he relaxed back into his usual lethargy. Another way to use this ploy is to design it as some other designer might — as Mies, DaVinci, Eames or Gio Ponti might have. While at it, run through a series of designs for imagined “special” customers such as Onassis, Gandhi, Grandma Moses, Ralph Nader, Sammy Davis, etc.

COMBINATIONS AND CRACKFILLERS

Combining two or more products into a new one (such as the clock radio or Boy Scout knife) may be a shortcut to innovation. But most combinations are ludicrous; over three hundred patents have been issued which screw a toothbrush onto the toothpaste tube so that it delivers paste up through the bristles.

A variation of “combination” is the “crackfiller” where a new product falls halfway between two similar products. The junior mixer falls halfway between the eggbeater and mixer. A successful example was to fit a new product between pliers and forceps. This “grasper” has a grip strength that approaches pliers by using the strength of the whole hand and yet it has the delicacy and reach of forceps.

BRAINSTORMING
Brainstorming (now called synectics) created a stir when Alex Osborn introduced it 25 years ago. A group thinks up every idea they can, regardless of how wild or impractical. Withholding criticism induces people to produce more and wilder ideas. But experience shows that someone who sees the “big picture” can ruin the process. If the problem were, for example, getting tanks across a trench and one participant said, “Why not lock tanks together to make a bridge of them?”; the “big picture” seeker might say, “War is hell,” or “Tank warfare is obsolete” and screw up any further flow of ideas. The best brainstorming groups are composed of people with diverse backgrounds.

LEVELS OF DESIGN

Changing levels can give designers an opportunity to innovate. A gasoline pump can be used as an example:

LEVEL 1: The designer accepts the pump’s performance but shortens and cleans up its form.

LEVEL 2: Performance improvements are made. Either money, gallonage, or fillip can be punched directly. Inserted credit card automatically bills the customer.

LEVEL 3: Changes the basic mechanism. The station is like a parking lot where hoses are pulled from trap doors below ground. All the controls are on the nozzle.

LEVEL 4: Involves products which are outside the company’s control. No liquid fuel is pumped; pressurized cartridges are inserted into the car. One cartridge fits all cars (like sealed beam headlamps), a one–price sale.

LEVEL 5: The service performed is changed; there are no more gas stations. Fuel cartridges are bought anywhere, like beer.

LEVEL 6: The service is eliminated; cars never need refueling, they run indefinitely on atomic power.

LEVEL 7: Transportation is eliminated; all human contact is by telecommunications.

Most design problems are solved at level 1; a few are at level 2. A designer may get one level 3 job in a lifetime. Picture the look on a client’s face if after assigning a designer the task of redesigning a gas pump, he is told that the solution is telecommunication. This example, which may seem ridiculous, is a real problem.

At GM, Advanced Design produced “Autoline,” a “U” shaped highway where the vehicles flew along at 150 mph guided by their wheels on the sides of the road. Because GM could do little to implement such radical ideas, Advanced Design was phased out, largely because they continually designed at too high a level.

DENOVATION

A product for every task is a Victorian idea. If someone is faced with doing 627 tasks in a day — awakened by an alarm clock, brushing teeth, cooking eggs, being transported to work, etc. — and a product is required for each activity, then there must be 627 different products to buy, operate, maintain, replace, junk, etc. Innovation, which has provided so much comfort and security, ought to be an unqualified blessing. But innovation can become parasitic by increasing the complexity of our lives. Many products produce more problems than they solve. Denovation may be a better way to deal with performance than is innovation. Denovation, the opposite of innovation, is the attempt to simplify or reduce the number of products without reducing the service performed. This design concept makes sense of mass production over the short–range future. But denotation takes more intelligence, skill, and technical insight than does innovation.

Packaging denotes many products. Soft margarine eliminates the refrigerator’s “butter keeper;” aerosol whipped cream eliminates the electric mixer; sliced meat and cheese eliminates the slicer; self–opening cans and bottles eliminate openers; instant coffee makes the percolator and grinder unnecessary; disposable pens eliminate ink bottles; wrinkle free permanent pressed cloth or disposable non–woven fibers get rid of the flatiron. Conscious rejection of products has been a tenet of many respected thinkers including Gandhi, Thoreau and Einstein (who said that “men don’t own objects, objects own men”). One denotation at IIT was to develop a single–denovation plastic ten dollar bill to replace the variety of metal and paper denominations we now carry with us. Store and vending machines would merely clip off pieces in proportion to the expenditure like punching a commuter ticket. This system could
well take greater advantage of the high-speed capabilities of electronic computers for counting, sorting and crediting and at the same time accommodate those instances where “cash” is used as in parking meters, vending machines, telephones and taxicabs, as a complement to the credit card society.

CONCLUSION

The cook book of mental “loosening up” processes may produce more vulgarity and absurdity than useful ideas, but to mental play can induce creativity. But to solve problems, it is not necessary to be creative, and many problems may only be solved uncreatively.

The difference between creative and non-creative problem solving is in the nature of the imposed restraints. As the restraints (i.e., cost restrictions, material specifications, size limitation, operational or configuration preconceptions, etc.) become more complex, the possibility for creative solutions decrease. With enough restraints the solution approaches singularity and becomes, as in many highly structured problems, unique and pre-determined with only the application of a known process necessary to reveal it.

Games, puzzles and most everyday engineering and mathematical analysis problems fall in the category of non-creative problem solving. For these problems goals are fixed, their nature is known, and the rules by which they can be reached describe a rigid labyrinth in which the player or problem solver may maneuver, but in which a tried and proven technique will almost certainly guarantee success. In contrast, the truly great solutions to problems on the forefront of the arts and sciences was not clear — even unknown — and the means of its attainment obscure.

The creative approach demands few or no restraints. That is not to say that to encourage a creative solution a problem should be vaguely defined, but extreme caution must be exercised to state clearly what a solution must do without saying how it must do it. Instead of the closed operation of the non-creative process, the creative approach presents the problem solver with an open-ended solution in which the widest latitude is left for solution. The fuzzier the form of the desired answer and the less-structured the means by which it must be attained, the greater is the chance that it may be a truly creative solution.

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