

Leverage Points

Summary of *Leverage Points: Places to Intervene in a System* by Donella Meadows (Sustainability Institute, 1999.)

Leverage Points: Leverage points are places within a complex system where a small shift in one thing can produce big changes in everything.

Ineffective Leverage Points: Changing the System's Physical Parts

Changing Constants, Parameters, and Numbers: Making minor adjustments to rates and standards consume most of everyone's attention, but they rarely change the system or the people they attempt to influence. The exception is when a parameter affects a positive feedback loop, such as birth rates or interest rates.

Examples of Ineffective Parameter Changing

Increasing funds for Stealth Bombers does not increase national security.

Caps on campaign spending does not cleanup politics.

Tinkering with managed health care has not made health care more affordable.

Infrastructure Changes: Some physical infrastructures - such as our transportation network - is simply built wrong. The only way to fix it is to rebuild it, but this leverage point is usually the slowest and most expensive kind of change to make in a system. Some stock-and-flow structures are impossible to change: the baby-boomers' pressure on services and systems, the rate at which contaminants get washed out of aquifers, the 10 to 20 year turnover of an inefficient car fleet.

Lengths of Delays Relative to Rate of System Changes: Delays in feedback loops often cause oscillations. If you want to adjust a system state to your goal, but you only receive delayed information about what the system state is, you will overshoot and undershoot. GM's investment in making SUVs prevented it from a timely response to the need for more fuel efficient vehicles. The time it takes for a price to adjust to a supply-demand imbalance is another delay example. Delays are often unchangeable. Things take as long to change as they take. You can't make a forest grow faster or build large capital projects faster than is possible.

More Effective Leverage Points: Changing the System's Information and Control Parts

Negative Feedback Loops: Negative feedback loops are self-correcting and keep important systems within bounds. A thermostat acts as a negative feedback loop - it has a goal (thermostat setting), a monitoring and signaling device, and a response mechanism (heating or cooling unit.) The strength of this control system depends on the accuracy of the monitoring information, the power of the response, and the directness and size of corrective flows.

In markets, the more the price is kept clear, timely, and truthful, the more smoothly they operate. Prices that reflect full costs tell consumers how much they can actually afford and reward efficient producers. Subsidies, fixes, not counting externalities, and taxes weaken the feedback power of market signals by twisting information to benefit those with wealth and power. Important leverage points are to return to the true cost pricing, internalize pollution costs, and avoid subsidies.

Democracies depend upon the free, full, and unbiased flow of information between the electorate and leaders. Billions of dollars are spent by candidates and elected leaders to limit and bias information so that they can get elected and to fulfill promises to corporate supporters.

The negative feedback loop has to be strong enough to impact what it is designed to correct. Democracy worked better before the advent of the mass media empire. Traditional controls on fishing were sufficient prior to radar spotting and drift nets. Whistleblowers need protection. A strong Freedom of Information Act reduces government secrecy.

The Gain Around Driving Positive Feedback Loops is self-reinforcing. The more it works, the more it gains

power to work some more. The more babies born, the more people grow up to have babies. The rich get richer. The more soil eroded, the less the groundcover, and the more soil erodes. Positive feedback loops are sources of growth, explosion, erosion, and collapse in systems. A system with an unchecked positive loop ultimately will destroy itself. Reducing the gain around a positive loop - slowing the growth - is usually a more powerful leverage point in systems than strengthening negative loops, and much preferable to letting the positive loop run.

Population and economic growth rates are leverage points because slowing them gives the many negative loops - technology, the markets, and other forms of adaptation which have limits and delays - time to function. It's better to slow a car going around a curve rather than demand more responsive brakes or technological advances in steering.

Control must involve slowing down the positive feedbacks. The leverage points are any place where the more you have of something, the more you have the possibility of having more.

The Structure of Information Flows: A high leverage point is adding a new loop that delivers information to a place it was not going before and causing people to behave differently. Missing feedback is one of the most common causes of system malfunctions. Letting people know that smoking cigarettes causes cancer led to fewer people smoking. Missing feedback must be restored to the right place and in a compelling form. Just telling people that we are running out of oil will only encourage capturing the remaining supply of oil. Once the price of oil is high enough, people will change their driving habits.

Requiring accountability is an example of this leverage point. People like to avoid responsibility for their behavior which is why so many feedback loops are missing. This kind of leverage point is popular with the public, unpopular with the powers that be, and very effective.

Most Effective Leverage Points Changing the System

Rules of the System define its scope, its boundaries, its degrees of freedom. Thou shalt not kill. Every American can exercise their civil liberties. Contracts are to be honored. The President cannot serve more than two terms. If you rob a bank, you go to jail. Constitutions and physical laws are strong rules.

Power over rules is real power. Lobbyists, Congress, and the Supreme Court justices are powerful. Pay attention to the rules and who have power over them. Change the rules and you will change the system.

Growth and Balance: The goal of every living population (and corporations) is to grow without limit. The goal of a superpower is to dominate the world, not necessarily benefit others with its form of government. The goal of an ecosystem is to keep populations in balance by frustrating the goal of each population to reproduce without limit and control all the resources. The goal to consume all the energy we can is balanced by the ability of the Earth to adapt to the ever growing pollution burden. Growth as a goal is only a bad one when it isn't balanced by a higher-level negative feedback loop that never lets an upstart power-driven entity to exceed control.

Paradigm Shifts. The deepest set of beliefs about how the world works constitute a society's paradigm. Money measures something real. Growth is good. Nature is there for us to exploit. Humans are the most highly evolved. One can "own" land. These and other European ideas are not universally shared by different cultures.

Paradigms give rise to system. From a shared social agreement about the nature of reality flows systems, goals, information flows, feedbacks, and everything else about a system. To change a paradigm, you keep pointing at the anomalies and failures of the old one, you keep speaking louder and with assurance from the new one, you insert people with the new paradigm in places of public visibility and power. You don't waste time with reactionaries but work with active change agents and with the vast middle ground of people who are open-minded.

Final Caution: The higher the leverage point, the more the system will resist changing it. In the end, power has less to do with pushing leverage points than it does with letting go.

Louise Gorenflo prepared this fact sheet, the 23rd in a series to encourage civic involvement in community problem-solving. Contributions made to The Learning Community are tax deductible. You may send your contributions to or request information from The Learning Community at 184 Hood Drive, Crossville TN 38555 (484-2633.)